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# The Farmer's Digest

From more than two hundred magazines and bulletins published in this country and abroad, the Editorial Staff of the Farmer's Digest selects articles of outstanding merit and general interest. It is comprehensive in its scope, covering all phases of Agriculture.


The Farmer's Digest

Published monthly at Ambler, Pennsylvania, by
The School of Horticulture

*25c a Copy* *$2.00 a Year*

*Foreign Subscription $3.00 a Year*

EDITORIAL STAFF—Editor, L. Bush-Brown
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Entered as second-class matter at the Post Office at Ambler, Pa., May 5, 1927, under act of March 3, 1879



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# The Farmer's Digest

Vol. II September, 1938 No. 5


## Why Cows Leave Home

**Condensed from Successful Farming**

*D. M. Seath*

TODAY we milk her and tomorrow we don't. Cows don't stay long on average dairy farms, judging from figures of dairy-herd-improvement-association herds in Kansas and Iowa. These data, which are probably representative of the better dairy farm herds of the United States, show that during 1935 to 1937, inclusive, an average of approximately 30 percent of the cows left the herds each year. In other words, the cows stayed in herds an average of about 3⅓ years. Obviously some of the cows remained in the herds for a much longer time than this, yet enough left in less than the average time so that, speaking generally, a herd-owner had a new herd every 3⅓ years.

The seriousness of the short time that cows remain in dairy herds is understood when we use a little arithmetic. If 3⅓ years per cow in the herd means 3 calves (14 months has been found as the average calving interval in the Iowa herds) and half are bulls, then each cow leaves an average of 1½ heifer calves which will grow into possible replacements. Iowa Experiment Station figures show that less than ⅔ of the heifers born in their herd escape the hazards of disease, accidents, and so on, and finally join the producing herd. The farm herds probably lose about ⅓ by similar routes, and thus the end result is that a producing cow has 1 offspring to replace her. This explains the difficulty buyers, particularly club members, have in locating heifers in disease-free herds that are practicing intelligent culling.


Reprinted by permission from Successful Farming, Des Moines, Iowa

*Why Cows Leave Herds*

(Three Year Average 1935-1937)

| | Kansas % | Iowa % |
|---|---|---|
| Low Production ..... | 32 | 35 |
| Udder Trouble ..... | 9 | 6 |
| Sterility ..... | 5 | 5 |
| Bang's Disease ..... | 15 | 11 |
| Died ..... | 6 | 7 |
| Old Age ..... | 4 | 2 |
| Dairy Purposes ..... | 23 | 26 |
| Other Reasons ..... | 6 | 8 |

An analysis of the reasons why approximately 30 percent of the cows leave herds each year is found in the above table. Low production accounts for the highest percentage, with 32 to 35 percent leaving for this reason. The percentage that can be moved because they are poor producers apparently is affected by the fact that from 65 to 68 percent leave the herd for other reasons. Under classifications of Udder Trouble, Sterility, and Bang's Disease, 29 percent left Kansas herds and 22 percent Iowa herds. This is evidence that herd-owners are attempting to keep their herds free from disease. It is probably, however, that many of these disease animals are low-producing and are removed primarily for this reason.

There is some indication that the prevalence of udder diseases is on the increase. The percentage culled for this reason in Kansas increased from 7 percent in 1935 to 10 percent in 1937.

Cows sold because of Bang's Disease hit their peak in 1935. For that year, the percentage leaving because of Bang's was 15 percent in Iowa and 24 percent in Kansas. During that year the newly inaugurated Government's Bang's-eradication program, combined with the feed shortage resulting from the short 1934 crop, caused many to remove the positive reactors. This trend declined in 1936 and still further in 1937 when 8 percent of those leaving herds from both Iowa and Kansas did so because of Bang's Disease.

It is surprising to note that only 10 percent or less of those removed from herds left because they were old or died within the herds. Dairy purposes on the other hand took almost ¼ of those leaving. Many of these may have been lower than average producers for the herd, but were thought good enough to go into other herds for dairy purposes. Within the classification of "Other Reasons" were those that leave because of accidents, reactors to T. B., and so on. For example, the Iowa average for 3 years showed that 4 percent of them left because they were T. B. reactors and 1 percent because of accidents.

The solution to this replacement problem is a challenge to present-day dairy-cattle-breeders. The intelligent selection of bulls so as to have a high percentage of the daughters of each bull of such merit that they deserve to stay in the herd will obviously decrease the necessity for heavy culling. Such a program seems necessary if disease and other factors take the heavy toll from the herd that they take at the present time. In addition, it is imperative that the selection of bulls, and the cows to which the bulls are mated, should be for longevity. In other words, the cow should be capable of more than 3⅓ years' production. Many cows, obviously, have been staying in the herds longer than this, yet the low average would indicate that greater emphasis should be placed by all dairymen upon high lifetime production.

Greater attention to health and sanitation in connection with the herd will assist in reducing the number of animals leaving the herd because of disease. This program is not an easy one to handle and will require continuous application if a reduction in such losses is to be effective.

All facts available today indicate that the greater use of good pasture and legumes will do a great deal to reduce many of the losses from dairy herds. Good, green, succulent pasture with its rich store of vitamins and minerals is recognized by all nutrition authorities today as the most perfect ration for the dairy cow. Its general use will result in more nearly furnishing to the producing animal and those developing into producing age, the nutrients needed for proper health and good production. Likewise, the winter's ration, when rich in good, green, leafy, legume hay, results in better maintenance of good health and production thru the winter months. This feeding procedure, which can be summarized as more roughage and pasture and a little less grain, may result in a slightly lower yearly production per animal but will, it is contended, cause more efficient production and extend the lifetime production period of the animals concerned.

# Ranching, 1938 Style

**Condensed from Acco Press**

THANKS to the genius of Hollywood scenario folk and to the imagination of the pulp magazine writers of the East, the average American still thinks of the Texas cowboy in terms of "yippee, yippee, yippee"; "ride, ride, ride"; "shoot, shoot, shoot." While I am among the first to shed a genuine tear over the passing of that hardy individualist, the old cowhand, I want also to step right up and shake hands with the new order of gentry who presently preside on the range. Times are tamer, it's true: there are no more pot-shooting Indians, cattle rustler hangings are seldom and fence-cutting feuds few and far between. But your cattleman of 1938 has his worries and his troubles just the same, though they are not tinted with the vivid colors of blood and thunder. And he still has to work; and more than ever he has to use his head.

Generally speaking our cattle population today is confined to comparatively small pastures and feedlots. The breed of cattle is of primary importance and the careful feeding of home-grown feedstuffs and bought concentrates is of concern if profits are to be realized in the highly competitive market.

There are, however, quite a few large ranches in operation in the Southwest today. This is to be a story of one—the Reed & Snyder outfit which works some 20,000 head of cattle on three ranches: the 300 section ranch at Whiteface in Yoakum County, the 100 section place at Seagraves in Gaines County and 50,000 acres of grazing pastures on the Crow Reservation in Montana.

It is difficult to imagine the expanse of this acreage. All I saw in a day's time was the feed and loading pens at Whiteface and the eastern part of the pasture. We drove out in the ranch far enough to lose sight of a fence or windmill. You have to do that to appreciate the sentiment behind the old ballad "The Lone Prairie." The ranch at Whiteface is only 12 miles wide by 25 miles long, but in solid pasture land that's an expanse.

When I asked Mr. Snyder over the 'phone when I could see him he said that he would be at Whiteface the next day loading out a few steers and that he would be glad to talk to me at that time.

**Reprinted by permission from the Cicco Press, Feb., 1938, Houston, Texas**

Reckoned in comparison to the herd he runs the shipment *was* small—only 211 head. I suppose the area in the pens occupied covered less than one-fourth of a city block, but to me the sale was a liberal education of today's value of good beef on the hoof. They were only two-year olds, grass fed with a little cake on the ground last winter. They averaged 877 pounds, sold at 10 cents, which figures out that Mr. Snyder got a fat check for $18,504.70.

The first ranchers of the Southwest gave scant thought, if any at all, to the breed of their cattle. Their main worry was finding grassy land on the open range. That practice of operation is, however, a closed and forgotten chapter in modern animal husbandry. All the cows on the Reed & Snyder ranch are good grade Herefords and the herd bulls are registered.

Next comes proper feeding and care. The ranch at Whiteface requires the services of around 15 men in the summer—more in winter when feeding is necessary. These men "work cattle" in the regulation way: aside from constant surveillance of the herd there are fences to be ridden, 56 windmills to look after (and to be augmented by engine power if the wind lays down) in addition to the annual branding, earmarking, cutting and vaccinating routine in the spring.

Cowboys furnish their own saddle and clothes; the ranch provides a horse, room and board and $35 to $50 a month pay.

The feeding program at the Reed & Snyder ranch is one that staggers imagination. At Whiteface headquarters alone there are 14 trench silos. All are 16 feet wide at the top and 12 feet wide at the bottom. Each is 10 feet deep. The longest trench is 400 feet. At Whiteface 8000 tons of ensilage were stored last year—20,000 tons in all at the three feeding pens: and that, I remind you, is a lot of feed!

"It's the solution to the cattle feeding problem," said Mr. Snyder. "The feed keeps perfectly and indefinitely. There is no loss in weight as is the case when it is stacked above ground and no damage from wind, rain or dust."

The rows of trenches were dug by fresnos pulled by teams and by tractors and by the draglines of dirt contractors called in at a last moment to get the job done.

Corn and grain sorghums were bought by the ton from the farmers in the neighborhood. Mr. Snyder estimates that the cost of digging the silos, cost of the feed and of putting it away underground was $5 a ton last fall.

With the abundance of feed this year, however, and with the trenches already dug the cost per ton should be cut in half, he thinks.

When the silo filling operation begins in the fall farmers bring in the feed in an endless line. The cutter chops heads, stalk and all. It is mixed with water, blown into the trench and thoroughly tramped with horses and mules. When the silo is full it is covered over with dirt and allowed to cure for 30 days. Then it is ready to be evacuated by a specially built elevator into wagons and taken to the feeding pens as needed.

On the Reed & Snyder ranch approximately 35 acres of land are necessary to take care of one head of cattle.

To ward off loin disease the cattle are given bonemeal with their salt in the ratio of one part bonemeal and two parts salt.

Range cattle are fed seldom, if at all, during the summer. Cows are fed cottonseed cake on the ground for 60 to 100 days during the hard winter months.

Normally from 4000 to 5000 steers and 10,000 to 12,000 sheep are brought into the feeding pens and fattened between November and July, the quantity in each instance depending on the price and availability of feed and the livestock market. Last winter, for example, 12,000 steers were prepared for shipment.

Perhaps the 20,000 tons of ensilage stored by the ranch sounds like a tremendous quantity of feed. It is, but the appetite of a big, husky steer is also enormous.

"A big steer will put away as much as 50 pounds of ensilage a day," said Mr. Snyder, "and tops it off with five to seven pounds of cottonseed cake for dessert."

Only the cake isn't eaten last as dessert. Pea cake (calves get screenings) is placed in the troughs in the early hours of the morning and is eaten first by the cattle. Later the ensilage is hauled in to be consumed throughout the day. Limestone is added to supply Vitamin A as a guard against the malady known to cowmen as "mealiness" or "night blindness."

Cattle are finally finished on dry grain which is heavy in protein.

The Reed & Snyder cattle have always been fed out as a classy lot. Year in and year out they have topped the prevailing market from 1½c to 3c. Some of the steers have dressed out as high as 64%.

It is obviously impractical for a ranch the size of Reed & Snyder to attempt to produce the feedstuffs necessary to fill all their big trench silos. As it stands they offer a constant feed market for the farmers of the surrounding area. Further it offers them a

hedge against getting caught short of feed. Should a drought occur in their immediate section they could go farther afield for their supply.

They do, however, operate a small (?) farm of 800 acres nearby. It is maintained for the purpose of raising early feeds which come into harvest ahead of the usual grains of that section; to provide feed for the 125 saddle horses, 40 work horses and mules and the 75 stock animals (mares and colts). The ranch breeds all its own work stock.

Also on the farm a sizeable pen of hogs is kept. Each winter 75 head are slaughtered and their meat cured for use on the dining tables of the different ranch headquarters and for the chuck wagon on the range.

It is indicative of Mr. Snyder's good management that he stores the cured meat in cottonseed oil. "It loses no weight, it is kept clean and free of dust and insects, it keeps indefinitely, it tastes better and the oil can be used over and over again," he explained. That it tastes better, there is no doubt. We had some of the ham at lunch at the bunkhouse and it was excellent.

Fred Snyder was born in Texas 55 years ago. As a youngster he spent much time on his father's ranch located between Lubbock and Colorado City when that country was neither criss-crossed with concrete roads nor sprinkled with fields of growing crops.

Even without his big hat and cowboy boots there could be no mistaking him for a cowman of the old school. Out of the old days he has brought with him a ruggedness, a certain sense of balance which has served him faithfully and profitably in the 1938 ways of ranching.

## Silos

THE Romans had the idea of ensiling forage, and there is some evidence that silage was put up 2,000 years ago in what is now France. The modern silo seems to date from 1850, when Auguste Goffart, in France, began working with the idea. About 1875, he published the result of his experiments and was awarded the Cross of the Legion of Honor.—*The Furrow*

# Breeding Dairy Cattle

**Condensed from Guernsey Breeders' Journal**

*O. E. Reed*

Chief, United States Bureau of Dairy Industry

IN any discussion of the problem of obtaining greater income for the dairyman's efforts, the first suggestion that usually comes up is that prices should be fixed or controlled or regulated. As important as it is for dairymen to be able to command a satisfactory price for their product, it is not the most important method of increasing dairy income. It is far more important to reduce the cost of production, and thereby also reduce the selling price, so that more people can afford to buy and use all the milk and other dairy products they want. Methods of reducing the cost of milk production are largely in the hands of the individual dairy farmer.

The two most important essentials, from the standpoint of efficient or economical production, are good cows and proper feeding and farming methods.

Our various breed associations had as their original purpose the improving of the nation's cattle. Some progress has been made in the last quarter of a century. Some evidence of this is seen in the fact that only 192 cows are milked for each 1,000 of our population today as compared to 250 cows per 1,000 in 1870. Moreover, 192 cows supply more milk for 1,000 people than the 250 cows did, for as I have said per capita consumption has increased. Much of this progress in the development of better average milk cows undoubtedly is due to the work of our pure bred breeders, whose herds have furnished the bulls for grading up our common stock.

But our job as breeders of better dairy cattle is not yet completed. How are we to further improve the efficiency of this great mass of dairy cattle?

We have always considered that improvement must come through selective breeding and the use of registered sires. We have put forth much effort in the years past, but still the average cow remains a relatively inferior producer. We can cull out these inferior cows and thus raise the average production of the herds,

Reprinted by permission from the Guernsey Breeders Journal, July 1, 1938, Peterborough, N. H.

but that is an expensive procedure. Culling in the average herd for all reasons now amounts to about twenty per cent each year. This could be materially reduced if we could improve our breeding methods so as to reduce the percentage of inferior producing females born every year.

Have we used the best methods of breeding to supply the right kind of herd sires for these farm herds? What is the most effective method of improving our cattle today through breeding?

I am not sure that any one of us knows the answers to these questions. Many theories for breeding better dairy cattle have been developed and tried with varying degrees of success.

Today I should like to tell you something of the work the Bureau of Dairy Industry has been doing in an effort to develop better breeding methods. We do not contend that we have the final solution to the problem, but we have been following a planned breeding procedure for twenty years and the results, we believe, indicate that we are on the right track. Many breeders have been following the same system, also with satisfactory results.

When the actual breeding investigations were started at Beltsville in 1920, the proved sire was considered to be the most promising carrier of improved germ plasm, and the continuous use of proved sires appeared to be the method for concentrating the inheritance for a uniformly high level of production. In the Jersey herd, eight proved sires have been brought in for service and the results achieved through their use have confirmed our faith in the proved-sire system of breeding.

The average production of the foundation cows in this herd was 11,626 pounds of milk and 624 pounds of butter fat. Not all of the eight sires were used in sequence, some of them being used concurrently. But every sire got daughters whose production averaged well above that of the foundation group.

For five of the eight sires the story is finished. All sixty daughters of these five sires have completed production records as follows: fourteen daughters of one sire averaged 12,310 pounds of milk and 641 pounds of butter fat; sixteen daughters of another averaged 12,275 pounds of milk and 646 pounds of butter fat; ten daughters of another averaged 12,211 pounds of milk, 670 pounds of butter fat; ten daughters of another averaged 12,799 pounds of milk and 678 pounds of butter fat; ten daughters of another averaged 13,603 pounds

of milk and 743 pounds of butter fat.

The other three sires still have daughters to be tested, but their performance to date as indicated by twenty-six daughters is as follows: Eight daughters of one sire averaged 14,379 pounds of milk and 662 pounds of butter fat; fifteen daughters of another averaged 12,582 pounds of milk and 697 pounds of butter fat; three daughters of another averaged 12,911 pounds of milk and 669 pounds of butter fat.

The grand average for the eighty-six daughters of the eight Jersey sires is 12,760 pounds of milk and 674 pounds of butter fat. The dams of the eighty-six daughters averaged 11,823 pounds of milk and 634 pounds of butter fat, a difference of 937 pounds of milk and forty pounds of butter fat in favor of the daughters.

The significance of these results is apparent when we look at the results of the germ plasm survey as reported in the 1936 Yearbook of Agriculture. In the 181 Jersey herds that were analyzed, the 2,393 foundation cows averaged 435 pounds of butter fat and the 8,050 additions—that is, the progeny of 1,160 sires—averaged 439 pounds of butter fat. There were 7,410 dam and daughter pairs, with the dams averaging 444 pounds of butter fat and the daughters 441 pounds.

Evidence of the progressive benefits of proved-sire breeding, in the eighty-six daughters of these sires, is indicated by the fact that the daughters topped by only one proved sire averaged 662 pounds of butter fat, those carrying two crosses averaged 682 pounds, and those carrying three or more crosses averaged 705 pounds.

Further evidence of the same kind is seen in the Holstein herd at Beltsville. The sixty-six daughters of the last five proved sires used in this herd averaged 19,283 pounds of milk and 711 pounds of butter fat, while their dams averaged 18,786 pounds of milk and 662 pounds of butter fat, a difference of 497 pounds of milk and forty-nine pounds of butter fat in favor of the daughters.

All the increased production we have obtained at Beltsville, both in the Jersey herd and in the Holstein herd, has been accomplished without the benefit of selection of females. No daughters were culled for any reason and all were given the same opportunity to demonstrate their inherent producing ability. All conditions of environment have been held uniform since the work began.

The breeding work at Beltsville, we believe, indicates that

the proved-sire system of breeding for improved production in dairy cattle can be followed with considerable assurance of success.

There may be some who think the proved-sire system of improving our herds for production is impractical, because the proved sires are not available. It is quite evident that if breeders would make an effort to prove out all the bulls now in service in their herds, all bulls would eventually become proved sires. Moreover, many of the sons of these proved sires can be counted upon to transmit desirable inheritance. With each top cross of proved sires the percentage of the sons that prove to be good will also increase.

At several of our field stations we follow the practice of loaning the sons of our proved sires to the dairy farmers near the stations. We do this to prove these sons. Since our Jersey herd was established at Jeanerette, Louisiana, we have loaned a total of forty-two sons of proved sires. So far we have proved seventeen sons that represent six proved sires. Now here is the interesting point. All but three of the seventeen sons raised milk production in the herds in which they were used, and all but four raised butter fat production. Compare that with the average dairy sire used in farm herds, even in the good herds in the dairy herd improvement associations, where only one bull in three has been good enough to raise production.

From Beltsville, we have loaned sons of five of the proved sires I mentioned earlier in discussing the Jersey project. Of twenty-one sons that have been proved so far, all but two have raised both the milk and butter fat production of the herds in which they were loaned. The twenty-one sons had 224 daughters and they averaged forty-six pounds better in butter fat production than their dams.

The ability of the sons to carry on the good work of their proved sires is not confined to the Jersey breed. The same thing is strikingly shown by our results at the Huntley, Montana, field station, with Holsteins. Out of forty-nine sons of six proved sires, all but five raised milk production in the herds in which they were used and all but three raised butter fat production.

One of these proved sires had eighteen sons, and only one of these sons failed to raise production in the herd in which he was used. The eighteen sons were mated to 160 dams that averaged 10,063 pounds of milk and 354 pounds of butter fat. The 160 daughters averaged 11,591 pounds of milk and 413 pounds of butter fat, an increase of 1,528 pounds

of milk and fifty-nine pounds of butter fat.

So far, in discussing the subject of breeding better dairy cattle I did not mention the type of animal we should try to breed. In our work we have emphasized producing ability rather than form or type, because we feel that economical milk and butter fat production should be the ultimate objective of all dairy breeding endeavor.

The statement is often made that type and production in dairy cattle are correlated. If it is true that type and production go together, one should be able to obtain good type when he breeds for production just as readily as he would obtain good production when he breeds for type.

Our own preference is to direct breeding effort along production lines. It is the milk and butter fat produced by the herd which affords the breeder the greatest part of his income. Breeding for production, we believe, is playing on the safer side.

# Use of Chemicals in Plant Breeding

**Condensed from Farm Research**

*B. R. Nebel and M. L. Ruttle*

**New York Agri. Experiment Station**

THE ancient Byzantines occasionally suffered from gout. Among other non-availing remedies, the use of extracts of the autumn crocus, *Colchicum autumnale,* of Europe was prescribed. Ever since then, the potent alkaloid of this plant, colchicine, has been known medicinally and occasionally prescribed.

Not until in the 1930's did Blakeslee and Eigsti, and independently Nebel and Ruttle and later many others, investigate the action of colchicine on plants.

Colchicine is a specific intracellular poison which inhibits the separation of half-chromosomes during cellular division leaving most other cell processes unaffected. Colchicine thus allows the chromosomes to double but does not allow daughter chromosomes to form daughter nuclei. Thus, cells are formed under the action of this drug that have twice the normal number of chromosomes. Such cells may continue to live and may compete favorably with their unaffected sister cells.

The economic importance of

Reprinted by permission from Farm Research, July, 1938, Geneva, N. Y.

this simple observation is far-reaching. It is difficult to predict what colchicine will have done to plant breeding 10 years hence, but it is safe to say that with respect to applied genetics it may be likened to the advent of the steam engine with regard to transportation and traffic.

Illustrations on hand now show what colchicine will do to flowers. The same results may be expected with ornamentals and probably forest trees. We predict that vegetables, cereals, and fodder plants may be changed during the next 20 years as much as they have been transformed in the last 200, with due effort.

With fruits the greatest changes will come in the genus *Prunus,* among the cherries, plums, apricots, and peaches. Grapes, apples, and pears will benefit, but the departures will not be so radical. New forms may confidently be expected in the small fruits, especially currants and gooseberries and probably in raspberries and blackberries, but not in the strawberries in which, as in the apples, pears, and grapes, chromosomal evolution (polyploidy) may have proceeded to its natural limits without the help of man.

All of this will not come about by magic but by hard work and will require funds and trained personnel who will apply themselves to one objective at a time and must keep their respective breeding material under close microscopic observation until a number of stable new polyploid races are established which then may be handled by "classical" methods.

*Tried Out On Many Plants*

In the spring of 1937 we treated young seedlings of Guinea Gold and Dwarf marigolds, of snapdragons, pinks, petunias, tomatoes, corn, and clover in a 0.01 to 0.16 per cent aqueous solution of colchicine for times varying from 30 minutes to several hours. Following treatment in the higher concentrations the young seedlings became stunted, and developed short, thick, often ridged and chewed-appearing leaves. Some plants died while others gradually tended to outgrow the injury and appeared normal. Growth after the stunting, in some cases, appeared more vigorous than in the checks. When the Guinea Gold marigolds came into flower it was evident that several of the plants consisted of diploid or normal sectors intermixed with sectors and branches having more than the normal chromosome number.

Some of these flowers were very large and handsome and proved to be tetraploids, that is, plants with cells having four sets of 12 chromosomes, or 48

chromosomes in all. Seed from such heads gave rise to tetraploid seedlings which for a given head were uniform in size and type. The flowers from these seedlings were similar to the parent flowers and have produced fertile offspring in the third generation, which are in turn tetraploid, vigorous, healthy seedlings.

In certain cases hybridization between the Guinea Gold marigold and the dwarf French marigold, which is already tetraploid, occurred, producing very handsome plants which, so far, have been largely sterile, but which are more graceful than usual with marigolds and which have bloomed freely in pots for three months. Triploids have also occurred in different populations and one is a triploid with 35 instead of 36 chromosomes.

The tetraploid snapdragons are handsome plants with large flowers with more than the usual fragrance. Some seed have set and tetraploid seedlings will now soon be in bloom.

The tetraploid pinks and petunias are less obvious and so far show no qualities of particular advantage. The tetraploid tomatoes have set little fruit and are distinctly inferior but show different characteristics for different varieties.

Colchicine by itself will do nothing. Its use should be limited to those professional and amateur breeders who know intimately the plants with which they are working, have clear objectives for their researches, and have access to a cytological laboratory in which they may check the results of their field work and discover new lines of approach.

## Plant Breeding

IN Denmark, wheat that will yield 70 bushels and oats that will yield 120 bushels per acre are not considered unusual. High-yielding varieties of grains, grasses, legumes, and other crops have been developed and the seed made available to Danish farmers.—*The Furrow*

# Raising Quality Fruit on a Large Scale

**Condensed from Better Crops with Plant Food**

***Clay A. Whybark***

SUCCESS with apples depends on many factors, some of which are not fully appreciated by the commercial grower. One of these important factors is proper fertilization of the orchard. The grower should realize that for every ton of apples that he removes from his acreage he is taking 2.6 pounds of nitrogen, 0.2 pounds of phosphoric acid, and 3.8 pounds of potash from his orchard soils. These figures do not include the amounts necessary for growth and renewal in the trees. This additional requirement for plant food is appreciable. Many commercial orchardists have realized this requirement and actual loss of minerals and are now taking steps to overcome this drain on their soils.

The Congdon Orchard located near Yakima, Washington, is an example of a commercial orchard where definite results have been obtained from the proper balance of mineral plant foods in the fertilizers used. This orchard has approximately 419 acres of bearing fruit and during the past 8 years has used 1,687 tons of mixed fertilizer. The production manager studies the condition of the trees and either increases or decreases the ratio of the different elements in the fertilizer mixture, thus making a varied program.

The entire orchard is divided into tracts, and a record is kept of the fertilizer application and crop yield for each tract. To give the reader a better understanding of the fertilizer practices on this orchard it would be well to give the program for some of these tracts.

The following (with application at per acre rates) was used on the pear orchard:

1. Fall of 1929 for 1930 crop, 750 pounds of 3-10-10 mixed fertilizer plus 750 pounds of 1-10-10 mixed fertilizer, with an addition of 1,000 pounds of gypsum.
2. Fall of 1930 for 1931 crop, 1,500 pounds of 3-10-10 mixed fertilizer.
3. Fall of 1931 for 1932 crop, 1,500 pounds of 3-10-10 mixed fertilizer.
4. No fertilizer for 1933 crop.
5. Spring of 1934 for 1934 crop, 1,870 pounds of 8-5-12 mixed fertilizer.
6. Spring of 1935 for 1935 crop, the northern half of the orchard

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was fertilized with 489 pounds of 6-8-6 mixed fertilizer per acre. The southern half was fertilized with 1,291 pounds of 8-5-12 mixed fertilizer per acre.

7. Spring of 1936 for the 1936 crop, the northern half of the orchard was fertilized with 941 pounds of 6-8-6 mixed fertilizer per acre, and the southern half with 1,592 pounds of 8-6-8 mixed fertilizer per acre. The yield record on this 22-acre pear orchard is given in the following table:

| Year | Boxes of Pears |
|---|---|
| 1930..... | 694 |
| 1931..... | 674 |
| 1932..... | 678 |
| 1933..... | 728 |
| 1934..... | 821 |
| 1935..... | 830 |
| 1936..... | 794 |

Before the fertility problems on this orchard were studied and its plant-food requirements met, the planting produced around 500 boxes per acre of poor quality pears. The fertilizer program has produced an average yield (over 7 years) of 745.6 boxes of pears per acre, and they are of the best quality. This is an increase of 245.6 boxes per acre, due to proper fertilization.

The lack of a fertilizer application for the 1933 crop had no effect upon the yield for that year, showing that there evidently is some carry-over from one year to the next in this pear orchard. The high level of productivity was maintained in 1934 by an extra heavy application of mixed fertilizer.

The following program (with application at per acre rates) was used on one of the apple tracts:

1. Fall of 1929 for 1930 crop, 1,000 pounds of 3-10-10 mixed fertilizer plus 1,000 pounds of gypsum.

2. Fall of 1930 for 1931 crop, 1,000 pounds of 3-10-10 mixed fertilizer.

3. Fall of 1931 for 1932 crop, 1,000 pounds of 3-10-10 mixed fertilizer.

4. No fertilizer for 1933 crop.

5. Spring of 1934 for 1934 crop, 918 pounds of 3-10-20 mixed fertilizer.

6. Spring of 1935 for 1935 crop, 880 pounds of potash plus 880 pounds of bone meal (4-15-0).

7. Spring of 1936 for 1936 crop, 530 pounds of potash, plus 530 pounds of bone meal (4-15-0), plus 161 pounds of 3-10-10 mixed fertilizer.

It is interesting to note that in 1933 when no fertilizer was applied, the yield dropped to 462 boxes per acre. Evidently in this tract the carry-over of fertility has not been great enough to maintain high production.

The yield for this 33-acre apple tract is given in the following table:

| Year | Boxes of Apples |
|---|---|
| 1930 | 805 |
| 1931 | 734 |
| 1932 | 774 |
| 1933 | 462 |
| 1934 | 814 |
| 1935 | 582* |
| 1936 | 856 |

*In 1935 due to a very early freeze, several thousand boxes of apples on this tract were not picked.

The value of a good fertility program is clearly shown by studying the yield records before fertilizer was used and after it had been used over a period of years. A 3-year average before the fertilizer program was started shows an average yield per acre of 499 boxes. A 5-year average (not including the year no fertilizer was applied and the year of the early freeze) after the fertilizer program had been started, shows an average yield per acre of 796.6 boxes, or an increase of 297.6 boxes per acre. This increase is due to the proper use of mixed fertilizer.

A good fertilizer program not only increases the yield per acre but improves the quality of the fruit, both in keeping and grades. The percentage of repacks has been decreasing each year under the present fertilizer program, until in 1936 very little repacking had to be done on this orchard.

To realize the full effect of this fertilizer program upon the grades in this orchard, one must first study some of the picking practices. After these tracts are color picked a few times, they are stripped. The value of fertilizer is clearly shown in this last picking. The federal inspection certificates show that from 75 to 100 per cent of this final picking have good red color and will grade about 15 per cent "C" grade. This means 85 per cent extra fancy and fancy apples.

Cover crops play an important part in the production of quality apples, and it is only through proper fertilization that a legume cover crop can be maintained in an orchard under the present practices. With the orchard soil management programs usually practiced, a legume cover crop cannot last long in an orchard. Under constant fertilization with nitrogenous fertilizers and the severe disking that the cover crops are subjected to, the legumes are killed out, and the weeds and grasses take their place.

In contrast to the general run of cover crops, we find those of the Congdon orchard greatly improved with the present fertilizer program. The percentage of weeds and grasses in their legume crops has been decreasing and the quantity of alfalfa

increasing. This is brought about by giving the cover crop all of the phosphoric acid and potash it needs. Each year on this orchard the cover crop has to be mashed down so that the pickers can more easily move their ladders and equipment.

The results from these two tracts are typical of the whole orchard. This orchard is divided into 15 tracts, and the fertilizer practices are the same on all of them. The production manager varies his fertilizer application when the conditions show a change is needed.

The fertilizer program on this large orchard has been in the past, and will be in the future, based upon the requirements of the trees for high yields of fine quality fruit. This means fertilizing the soil with mixed fertilizer to supply all the necessary plant foods, including generous amounts of available potash.

# Humus and Fertilizers

**Condensed from California Cultivator**

***R. E. Stephenson***

WHY make so much fuss about humus when plants may be grown successfully in water cultures, or in sand without soil and with all the nutrients provided from an outside source? Why not use commercial fertilizers to grow big crops and forget the humus problem?

Before answering these questions I ask you to look about. Where are the big crops grown, on soils in which the humus supply has been neglected or where lots of manure, green manures, and sod crops have provided for regular renewal of organic matter? Look again at those soils where yields are disappointing and profits seldom found. Has humus renewal been neglected in these latter soils?

After you have investigated yields in relation to the significance of humus in the soil then consider these simple facts. There are easily available nutrients in every organic material which goes into the soil to make humus. More than half and sometimes nearly all the potassium of straw, legume wastes, stubble, weeds and other materials is soluble in water before any rotting occurs. Such materials, even on top of the soil, allow the potassium to become dissolved and carried to the root system of a growing crop. The same thing

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is true to a lesser extent of calcium, magnesium, and other elements. By contrast the same elements in the mineral portion of the soil are much less soluble.

Though there is seldom more than a small per cent of humus in the soil, a third or more of the total phosphorus, a large part of the sulphur, and nearly all the nitrogen are held in organic combination. As the humus or organic matter rots, these elements are liberated and absorbed by plant roots. Roots are especially stimulated by rotting organic matter, as are also the micro-organisms that bring about the rotting. These same organisms by virtue of the rotting humus and products for which they are responsible, bring about the solution of a certain amount of the more or less inert soil minerals. The clay and silt in the soil, therefore, serve as a reserve store for potash, lime and other things the use of which for plant production is contingent upon an abundance of active humus and vigorous biological action.

But fertilizers have an important place in plant production, and are more effectively used when associated with those practices which provide for humus renewal. Fertilizers are very friendly to humus especially when there is an abundance of the latter, and stimulate the micro-organisms so closely related to successful production of big yields. During the rotting of the organic matter the biologic life of the soil assimilates some of the fertilizer minerals, another portion is absorbed by the humus itself and a portion is combined with the silt and clay. That portion of the fertilizer absorbed by humus and the organisms associated with it is much more available to crops than that taken up by silt and clay. Of course the crops get a portion of the fertilizer before absorption occurs, but most crops require several months for growth. Through the growth period the rotting humus feeds the crop. The most striking example of the influence of humus upon crop production is found in the peat soils. The good peats have excellent physical properties, and are nearly ideal in regard to moisture and aeration. Peats respond to fertilizer, lime, phosphoric acid, potash and even nitrogen, to a greater degree than many mineral soils. Not often do mineral soils produce 1,000 bushels of potatoes or corresponding yields of various vegetable crops obtained from the best peats. The major portion of the peat soil is approaching the character of humus and the more nearly like humus the peat has become, the greater the production.

Never before have so many fertilizer questions come to me. Everyone seems to want to know what to use to correct some particular difficulty. There is one safe answer and that is, try certain treatments and see whether they work.

A grower stated that his berry canes were so brittle that he could not put them on wires without breaking the canes. Sounds like too much nitrogen, a little more phosphoric acid and potash was suggested. The confession that chicken manure had been used liberally lent strength to the suspicion that too much nitrogen was the cause of the difficulty.

One vegetable growing section had difficulty with beans produced for canning. The beans ripened too soon, or the bearing season was too short. Perhaps a side dressing of nitrogen fertilizer, which delays ripening and prolongs growth, in the early bearing stage would help the trouble. Side dressing with nitrogen fertilizers in vegetable production is becoming more popular, not once but as many as three or four times in a growing season. These side dressings make it possible to obtain a succession of harvests from the same plants, much greater than anyone had supposed possible.

The producer of ornamentals is interested in fertilizer. A grower of Christmas holly wanted more berries and better ripening. He was also a poultryman and perhaps had used poultry manure a little too freely. More minerals —phosphate and potash—should help, along with cutting down on the nitrogen.

Another confessed that he had used fertilizer carelessly—in the row with the seed at planting time, and germination was poor. That is the wrong way to use soluble fertilizers. Such materials should be placed in bands at the side of the hill or row and two to four inches away, neither under nor over the seed. Some seeds, beans for an example, are very sensitive when in contact with fertilizer.

The question of rates of fertilizer application is always coming up. It is hard for some to get the idea that 3,000 pounds an acre on a vegetable crop may be no more liberal, relatively, than 300 pounds on a grain crop. A grain crop may bring $30 an acre and a vegetable crop $300 an acre or even two or three times this amount. A small percentage increase in yield or even an improvement in quality of crop may justify the fertilization. The net returns from the fertilizer rather than the gross expenditure is the important thing.

Much more can be done with

fertilizers, manures, waste products and various soil treatments than has been done before. The problem of minor elements is coming to the front. Deficiencies of boron, copper, zinc, manganese and other materials appear in certain localities and sometimes create a widespread interest. There is a lot we do not know about this subject but there is an enormous amount of information available that is not being put to practical use.

# Battling Garden Bugs and Diseases

**Condensed from American Agriculturalist**

*Paul Work*
Cornell University

SOME troubles are best controlled by treatments before planting. I used a tiny bit of red copper oxide dust on peas, and it seems to help materially in giving a good stand. I omitted the treatment on some 50 feet of row this spring and the stand was only about half what it was on the treated row.

Early cabbage plants ought to have corrosive sublimate at the usual strength—1:1000—pouring the solution around the stem of the plant so that it follows down in and gives the hatching maggots a deadly dinner.

Cabbage worms are doing some damage now and the plants have had a dusting with rotenone dust—¾ of 1%. In commercial plantings, one may use an arsenical dust in the early stages of growth with some saving of money, but as maturity approaches, a non-poisonous insecticide ought to be used.

In dry seasons, aphis makes a good deal of trouble with cabbage. Careful dusting is helpful but a very careful lookout must be kept for curling leaves which indicates the beginning of the trouble. Then, the areas where this appears may be dusted pretty thoroughly. After the plant lice become distributed over fields, it is difficult to achieve control and the cost is heavy.

My most troublesome enemy is the Mexican bean beetle. The adults winter over so that lack of control one year is likely to make them worse the next year. We

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have started dusting with rotenone and we expect to make a vigorous campaign—keeping the new growth fairly well covered. The principal element in success with the Mexican bean beetle is starting early and keeping at it faithfully.

The striped cucumber beetle is quite damaging to young cucurbits soon after they get through the ground. The material used for control is calcium arsenate—one pound to 15 pounds of talc or gypsum. That would mean an ounce of calcium to about a pound of the diluting material. Also, a ¾% rotenone dust is satisfactory.

Home garden potatoes are best protected with a copper arsenate lime dust which takes care of blight and insects. It ought to be applied when the leaves are damp and when the air is still—early morning or in the evening. A dust made with 20 pounds of mono-hydrated copper sulfate, 15 pounds of calcium arsenate and 65 pounds of hydrated lime is a good combination. This may also be used in a 20-20-60 proportion. The dust may be purchased ready made. On a small scale, the proportion would be a pound of each of the first two ingredients, and 3 pounds of the diluting material.

Control of diseases and insects in the home garden, under most conditions, boils down to fairly simple propositions. Rotenone dust meets most of the insect needs. The addition of nicotine dust for aphis and copper arsenate lime dust for potatoes pretty nearly fill the bill.

There are many little hand dusters on the market to be had at prices all the way from 50 cents to $2.00. Unfortunately, most of them cannot be taken apart for cleaning, so that if any lubricating is to be done, it is best not to use oil as this collects dust. A little graphite powder will do the trick just as effectively and will not make trouble.

In all spraying and dusting, two things are particularly important. One is timeliness—beginning the treatment when trouble first appears and in some cases before it appears; then, this includes the necessary follow-up as long as the trouble is present. The second major requirement is thoroughness. One needs to go to some trouble to get dust and sprays to the underside of leaves—particularly, where this is the home of the insect or the disease. Thoroughness does not, however, mean heavy plastering of the foliage. Small applications applied lightly and evenly are generally just as effective as heavy gobs. One should learn to use the duster gently, evenly and thoroughly.

# Construction and Use of the Trench Silo

Condensed from The Southern Planter

*J. A. Arey*

Extension Dairyman, North Carolina State College

THE trench silo is an inexpensive type of silo. It is well adapted to the medium or small size herd. In 1932 the first silo of this type was dug in North Carolina. Beginning with that year and including 1937, 1,300 have been dug by North Carolina farmers.

The labor cost on many of these silos has been around 50 cents per ton. In many cases no actual cash was paid for digging since it was done during odd times by the regular farm labor. The material needs for the roof of an average size trench silo can usually be secured on the farm at small cost.

The construction of the trench silo is simple. The only tools needed consists of a plow, drag pan, shovel, pick and a team or tractor.

The equipment required for filling the trench silo is less expensive than that required in filling the vertical silo since a small cutter without blower will do the work satisfactorily. Such a cutter with a capacity of three to five tons per hour can be operated with a 5 h. p. gasoline engine.

To give best results the trench silo should be convenient to the place where the cattle are to be fed, and should be located where good drainage is possible. The most desirable soil is a stiff clay, free from rock. When possible it is best to locate the trench silo on a slope or hillside, digging the trench back into the hill. By giving the bottom of the trench a slight slope towards the lower end natural drainage can be secured. When a hillside location is not available, it is often possible to drain the trench by means of a small tile leading to a ditch or other lower elevation. Small stones should be placed around the intake so as to prevent silage from clogging the tile.

The size of the trench silo should be determined by the number of animals to be fed and the length of the feeding period. The depth multiplied by the average width and that by the length will give the capacity in cubic feet. For example: a trench silo, six feet deep, seven feet

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223 Governor Street, Richmond, Va.

wide at the top and five at the bottom (averaging six feet wide) and 70 feet long would equal 6x6x70 or 2,520 cubic feet. The weight of a cubic foot of silage from a trench silo is about 35 pounds. In this case the total weight would be 2,520x35 or 88,200 pounds.

The number of cubic feet of silage needed by a herd can be determined by multiplying the number of cows to be fed by the number of days in the feeding period, since the average cow will consume a cubic foot of silage each day. For example, to feed a medium size herd of 20 cows 180 days would require 20x180 or 3,600 cubic feet of silage.

The width and depth of the trench silo should also be governed by the number of cows to be fed daily. A slice of silage three to five inches thick beginning at the top and extending to the bottom of the silo should be fed daily in order to prevent spoilage. When the area represented by the width and depth is too large for the number of cows to be fed daily, excessive spoilage will take place. Capacity should be secured by increasing the length of the silo rather than the width or depth.

The following table gives the size of the herd, the suggested width, depth and length of the silo based on feeding a cow one cubic foot of silage daily for a period of 180 days:

| No. of cows | Width at top, feet | Width at bottom feet | Depth feet | Length based on 180 days feeding period feet |
|---|---|---|---|---|
| 6 | 6 | 4 | 5 | 43 |
| 8 | 6 | 4 | 5 | 58 |
| 10 | 7 | 5 | 5 | 60 |
| 12 | 7 | 5 | 6 | 60 |
| 14 | 7 | 6 | 6 | 70 |
| 16 | 8 | 6 | 6 | 69 |
| 18 | 8 | 6 | 7 | 66 |
| 20 | 9 | 7 | 7 | 64 |

After the location is determined measure off the desired area and mark each corner with a stick. Plow the land within the measured area and remove the loose dirt with a drag pan. When the land on which the silo is located is practically level the ends of the trench should be gradually sloped to the surface so that the team can walk in and out without difficulty. It is advisable to leave the slope in the end from which the silage is to be removed so that the silage can be hauled out in a cart. The other end should be dug out and given the same slope as that of the side walls. The side walls should be smoothed and sloped with pick and shovel. Loose soil, such as sand, will cave easily and when it is necessary to locate a silo in such soil the walls should be reinforced with concrete or lumber.

When lumber is used it should

be thoroughly dried before erection. The plank should be placed in an upright position and not lengthwise with the trench and should be treated with hot creosote. The side walls, regardless of whether they be clay, concrete or plank, should be smooth so that the silage will pack tightly against them. If the walls are rough air pockets will be formed which will result in spoiled silage.

A roof is not needed to preserve the silage, but is needed to prevent the walls of unlined trenches from crumbling due to weather action when the silo is empty. The kind of roof to build will depend upon the available material. On farms where inch planks are available an inexpensive roof of either gable or shed type can be constructed out of them.

Silage should be cut in ½-inch lengths since it packs better than if cut longer. The knives of the ensilage cutter should be kept sharp and adjusted close to the shear plate so that a clean cut will be secured.

The silage should be thoroughly packed by persons, animals or a tractor while it is being put in the silo. Special packing should be done around the walls. To aid in packing, and thereby improve the keeping qualities of the silage, water should be added to it continuously during the filling operation. This can be done conveniently with a hand sprinkler, or a water hose. If the cutter used has a blower attached, the water may be allowed to flow directly into the blower.

Regardless of the method used to distribute the water it is important to see that the silage next to the walls is thoroughly wet. Dry clay walls tend to absorb moisture from the silage.

When the silo is completely filled, cover it three to four inches thick with a layer of cut straw, chaff or Sisal Kraft paper. When straw or chaff is used wet and thoroughly pack, then cover with 10 to 12 inches of soil, which should also be wet and well packed. Sisal Kraft paper is preferred to straw by many since less dirt is required to cover the silo. The top of the silo should be completely covered with this paper. Since it lies close to the silage only 5 or 6 inches of dirt need be placed on top of it to exclude the air.

To remove silage from a trench silo begin at the drainage end and first remove the covering each day from the part of the silage to be fed that day. Beginning at the top and going through to the bottom of the silo a slice of silage not less than three inches thick should be removed from the end each day to prevent spoilage.

# Canada Thistle, a Menace

**Condensed from The Rural New-Yorker**

*Oliver C. Lee*

CANADA thistle is probably the most widely spread of all perennial weeds. It was introduced into the Northern States and Canada, and gradually is making its way southward until at present, it can be found over the northern half of the States. In the northern portion of this section, fields of several acres in size are infested while in the southern portion it is still confined to patches, usually circular in shape. If you will dig down into one of these patches and note the roots you will learn the reason for their shape and habit of growth. The plants produce lateral roots that run under ground and in turn send up new plants. Thus several plants are attached to the same root stalk.

The plants of Canada thistle vary in height from two to five feet. The stems carry numerous long spiny leaves, somewhat crinkled. There is, also a variety of Canada thistle that has very few spines and the leaves are flat and only slightly notched. The flowers are purple or blue in color and of the composite type. Upon maturity they have a white downy appearance brought about by the development of a silk-like parachute that is attached to the top of the seeds. The parachute-like structure aids in spreading the seeds. Winds may carry them for miles. The seeds are a straw color, shaped very much like a banana.

Three methods of eradication have been found to be effective. All three of them have their place in a Canada thistle eradication program. Spraying with sodium chlorate is useful for the eradication of small patches of Canada thistle. Its practicability of use on areas of one-half acre or more in size may be doubtful, due to the high cost of the material. The amount necessary to produce a complete kill is approximately three pounds per square rod. On the other hand a few dollars invested in chlorate to eradicate that small patch may save a whole field from becoming infested. Spraying should be looked upon as a method of prevention rather than a means of eradication after the thistles have become widespread. When sodium chlorate is used as a spray, the

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333 W. 30th St., New York City

solution should be made by dissolving one pound per gallon of water, used at the rate of two gallons of solution per square rod with the first application. The patch to be sprayed should be measured and the area calculated in square rods. Three or four weeks following the first treatment the thistles should be resprayed using one gallon of the prepared solution per square rod.

Sodium chlorate must be handled with care. It is an oxidizing agent and creates a fire hazard when in contact with organic matter. Chlorate should be stored in metal containers. Care should be taken not to spill it in automobiles or on wooden floors where a fire hazard may cause the loss of property. When spraying, wear rubber boots to protect the clothing. Clothing saturated with chlorate is dangerous to wear after it has dried out. Livestock should not be permitted to graze on treated areas until the vegetation has dried. Chlorate has a salty taste and is relished by animals.

In the past few years experiments and demonstrations in the field have found clean cultivation to be a practical method of eradicating Canada thistle. There is no cash outlay for materials and on large areas it is less expensive than spraying. The greatest drawback to killing thistles by cultivation is that it requires considerable time and the work must be done at the proper time to obtain results.

To kill Canada thistle by cultivation it is necessary to keep down the top growth for a period sufficiently long to starve out the roots. The leaves of the plants are the manufacturing center where the food materials are made to replenish the roots. Under ordinary conditions there is sufficient plant food stored in the roots to produce plants for one year without support from the green plant. If the plant is not permitted to produce leaves at any time during the season, from early Spring till late Fall, the roots will be starved out.

A cultivator with a broad cutting surface has proved to be the most satisfactory because of its ability to cut off all plants at a uniform depth. The implement should penetrate to a depth of four or five inches. A satisfactory cultivator can be made by attaching a cutting bar to a sled-like structure. Corn cultivators equipped with sweeps will do effective work. A disk or spring-tooth harrow is not satisfactory for the reason that it does not cut off all plants.

Besides being a valuable forage crop Alfalfa is particularly effective in eradicating Canada thistle.

As a rule thistle plants appear in the first cutting of Alfalfa for the first two years; after that they are not noticed. It is, however, necessary in most cases to leave the field in Alfalfa for four or five years to complete the job of eradication. When plowed too soon the thistles will come back and re-infest the field. It is not advisable to try to start Alfalfa where the thistle stand is exceptionally heavy. On such areas the Canada thistle should first be weakened by persistent cultivation. After that a rather thick seeding of Alfalfa should be made in Spring or Summer as seems best for the particular locality and soil conditions. Where the weeds are liable to choke out the young plants, plowing the field in the Spring and cultivating so as to keep all top growth down during June and July and the Alfalfa sown in August is often advisable.

# Restoring the Range

**Condensed from The Western Farm Life**

***Elmer J. Johnson***

ARE the grasses of the range country doomed completely to destruction? If they can be restored, what methods should be used to bring this about? What varieties are best suited to various conditions? All of these and many others are pertinent questions to those using range pasture and who may have drifting sand or weeds where grass once prevailed.

The United States experiment station at Akron, Colorado, has done outstanding work regarding range restoration. On one plot they planted roots of western wheatgrass, by some farmers called rescue grass, during the winter of 1934-35. These rootstocks were placed at 36-inch intervals in rows 36 inches apart. This grass spread rapidly during the summers of 1935 and 1936, making a complete sod by the spreading nature of the underground rootstocks and runners. Each year considerable seed was produced which helped to complete the seeding of the ground.

In 1937, a hay crop estimated at ½-ton to the acre was cut early in the season and by June 7 a second crop was several inches high. When not too growthy, this grass is relished by most livestock and even with seed stalks formed there are numerous leaves near the ground to meet livestock needs. The production of this seed would be a fine enterprise for some to undertake, be-

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cause it undoubtedly will be in demand.

Other good features of this grass include the fact that it forms a tough sod and spreads from the roots as well as by seed; it is well adapted to plains non-irrigated land over a wide area; apparently it does not winterkill, and at the Akron station it seems to be choking out the noxious poverty weed which alone would be worth much.

Crested wheatgrass and slender wheatgrass do not seem as well adapted as western wheatgrass to plains lands as far south as Colorado. Further north, or in the foothills of Colorado, they serve a real need. Crested wheatgrass especially is well known and liked by ranchers in the higher altitudes, foothill ranges and northern states.

Blue gramma grass is known and liked by nearly every range man. This grass is relished by stock during all seasons and they fatten out well on it in the fall, if a sufficient amount of the forage is available. This grass is slower growing than Western wheatgrass, but it is thought, where limited grazing is resorted to, that in time it will choke out the faster and more prolific growing western wheatgrass.

Planting these grasses in alternate rows is the ideal method to get a quick sod. Blue gramma grass seed, planted in rows at Akron on May 8, 1936, produced seed that year, and spread some between the rows. This definitely shows that some of the preferred range grasses will and can make a surprising growth, if given a fair chance. Continued grazing of pasture land does not permit enough top growth to store food in roots to overcome a period of drouth.

Galleta seeded in 1936 winterkilled some at Akron, but made a good recovery in 1937. Since it does winterkill, it probably should not be planted farther north than southern Colorado. In the panhandle of Texas this grass, as well as a type of rice grass, is well known. Both of these grasses are well suited for that area and they seem to be liked by most livestock.

Where row seeding of these grasses is practiced, it may be best to plant on contour lines. This would give the plants the best advantage of the available moisture. By seeding in low areas, draws and other favored spots, and then following deferred or rotation grazing an early stand is assured. In time it would spread to the less favored areas.

There is no economy in overgrazing. On a given area there is far more profit in putting 100 pounds of summer pasture gain on cattle than to put 50 pounds

gain on twice the number on the same range.

There are grasses suited to every range condition but in order to make them profitable a few rules must be followed. They are:

1—Never graze the grass so close it does not produce a seed crop.

2—Reduce your livestock to the amount where the range either improves or at least maintains its stand. This pays big dividends, even if the herd size is reduced.

3—Do not require livestock to travel long distances to water as this needlessly tramps out a lot of grass.

4—Leave some old grass on the range over winter to hold snow, prevent soil blowing and store plant food in the roots. This insures early spring growth.

5—Always practice deferred or rotation grazing.

6—Reseed those grasses best suited to the area.

7—Overgrazing now is the hanging of a mill stone about the neck of posterity.

Experiment stations have performed excellent work for farmers and ranchers. They have information from carefully conducted experiments over a period of years that would be profitable for many to follow. It behooves producers to consider seriously the facts they have to offer. They have definitely shown, as many farmers now know, that drouths are not serious, if desirable varieties of grasses are planted at the right date on land properly prepared.

# Do a Good Job When Drilling Fertilizer

**Condensed from The Michigan Farmer**

*Prof. R. L. Cook*

**Soils Section, M. S. C.**

FOR greatest efficiency, fertilizer must be uniformly distributed and applied at the proper rate per acre. Since the movement of nutrients in a lateral direction in the soil is very slow, it is essential that fertilizer materials be placed exactly where they are needed for greatest efficiency. This means the fertilizer must not only be placed in a continuous band of uniform magnitude or in equal portions in each hill, but that an equal quantity must be delivered through each drill or hopper on the machine. It is not uncommon to find grain and beet drills which deliver more fertilizer through some openings than through others. Such a condition is usually due to corrosion or excessive wear of the metal parts of the distributor or to hardened fertilizer. Where this occurs some rows will be getting too much and others too little fertilizer even though the total application on an acre basis is optimum for best results.

Sometimes the mechanism of a drill becomes worn to the point where feeding is of an intermittant nature. It is well to check this by running the drill for a short distance on a cement driveway or on hard ground. If the feeding mechanism is operating properly the bands will be uniform. If there are blank spaces in the bands or if they are heavier in some places than in others, the mechanism needs adjustment or repair.

The most difficult problem in the operation of any type of fertilizer distributor is the adjustment of the feeding mechanism to deliver a certain desired quantity of fertilizer per acre. Certain distributors are equipped with some type of graduated scale marked in pounds of fertilizer per acre, while others are accompanied by the manufacturer's chart indicating how the machine should be set to apply quantities of fertilizer. Such graduations and directions are intended as an approximate guide, otherwise it would necessarily be presumed that all fertilizers have the same specific gravity and mechanical condition. Anyone acquainted with commercial fertilizer knows

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that specific gravity varies with the ingredients of the mixture and that the mechanical condition varies with the moisture conditions as well as with the ingredients. It follows then that a fertilizer drill should be calibrated for each mixture which is to be applied and for each moisture condition which may prevail at the time of applying. Obviously such calibrations are impossible at the factory and so must be made on the farm at the time when the fertilizer is to be applied. It is the object of this article to present directions and calculations which may serve as a convenient guide for the farmer in setting his different fertilizer distributors to apply as nearly as possible each desired quantity of fertilizer.

Whatever machine is to be calibrated, the first step is to fasten the end of the tongue securely at a height about equal to that maintained during operation. A convenient method is to place the end of the tongue on bags of fertilizer piled against a post then tie the tongue firmly to the post. Next, jack up a wheel, remove the fertilizer delivery tubes from their housing and place pails under them to catch the fertilizer. If the tubes cannot be removed it is possible to catch the fertilizer on a canvas spread under the discs. In the case of one-wheel drive distributors, care must be taken, of course, to jack up the proper wheel.

Before filling the fertilizer hopper it is well to engage the gear, turn the drive wheel and watch the feeding mechanism to see that everything is working properly. If there is any hardened fertilizer in the hopper it should be completely removed.

After making sure that all moving parts are working freely, fill the hopper with fertilizer which is free from lumps. Lumpy fertilizer may be quickly put in good condition by passing it through a quarter inch mesh gravel screen.

The next task is to set the rate-of-feed indicator or quantity adjustment. This should be done by first closing the feeds on those machines having feed gates, then moving the indicator to the notch which seems to be the right one to give the proper rate of feed. Next turn the wheel several times until fertilizer is flowing freely from all the delivery tubes. Empty the pails which are to receive the fertilizer and all is ready for the next step in the calibration.

Tie string on the outer rim of the wheel and then turn the wheel 20 full revolutions. If the feeding mechanism is working properly all the delivery units should deliver the same quantity

of fertilizer. Sometimes, however, the rod which controls the feed gates becomes bent and as a result some gates open wider than others. It is a good plan to avoid this source of error by weighing the fertilizer from each tube. An accurate scale, one which will weigh small fractions, should be used. If the weights are all the same the drill is feeding uniformly through all delivery units. The final step in the calibration is to determine whether or not the total quantity of fertilizer is sufficient to give the desired rate of application. Pour all the fertilizer into one container and weigh it carefully. By referring to the accompanying tables one may quickly see if the first setting was correct or whether the feeds must be opened or closed to apply the right quantity of fertilizer.

*Using the Tables*

As an illustration of how to use the tables, suppose one is calibrating an 11 disc grain drill to apply 150 pounds of fertilizer with oats. Since practically all grain drills have 46, 47 or 48-inch wheels, figures are given only for the 47 inch diameter. Unless the drill is very old it is not necessary to measure the wheels. When the fertilizer is flowing through the 11 openings the amount delivered by 20 revolutions of the wheel should be 5.9 pounds for a field application of 150 pounds per acre. If on the first trial the quantity delivered should be too small, open the indicator one or two notches and repeat the process. If the quantity delivered is too great the indicator must be closed one or more notches. When this becomes necessary the indicator should be closed completely, then opened to the proper notch. This is to avoid errors due to play or spring in the indicator rod. If a 13 disc drill is being calibrated the procedure is the same except the quantity delivered by the full 13 delivery tubes is proportionately greater, 7.1 pounds for the 150 pound rate of application. If the desired rate of application is 250 pounds per acre and the drill being used is of the 13 disc type it is necessary to try different settings in a systematic manner until one is obtained which causes the drill to deliver 11.8 pounds of fertilizer per 20 revolutions of the wheel.

Many farmers plant row crops with the 11 and 13 disc grain drills. Table 1 provides for calibrations to apply different quantities of fertilizer in 28 and 42 inch rows. The figures are different from those given for planting small grains in seven inch rows because the effective width of the drill is greater. This is because, with the 11 disc machine, the wheel follows the wheel track rather than the outside disc

mark, and with the 13 disc machine a marker is used and the planting of four rows of beans or three of corn makes the effective width 112 inches or 126 inches respectively instead of 91 inches as it is when planting grain in 7 inch rows.

The data given in Table 2 is for use in calibrating such row crop machines as sugar beet drills, corn planters, and potato planters. With these machines it is first necessary to measure the diameter of the wheel as the wheel size varies with the product of different companies. If it is found that a certain 4 row sugar beet drill has a wheel diameter of 40 inches and the beets are to be planted in 24 inch rows it is only necessary to follow across in that line of the table and find that for a 200 pound application of fertilizer the drill must deliver through the 4 delivery tubes 8.5 pounds of fertilizer while the wheel is being turned 20 times. If the beets are being planted in 26 inch rows, then the quantity of fertilizer must be 9.2 pounds to give a 200 pound application.

As a further illustration, if potatoes are to be planted with a one row planter having 36 inch wheels it is a simple matter to jackup a wheel and calibrate the fertilizer distributor so it will apply the quantity of fertilizer desired. If this desired quantity happens to be 300 pounds per acre it is necessary to try different settings until the quantity delivered, according to the table, is 4.3 pounds. If a two row planter is to be used the adjustment of the indicator must be such as to deliver 4.3 pounds for each row.

Fertilizer attachments on cultivators may be calibrated in exactly the same manner as described for planters. Since these machines, like potato planters are designed to place a band of fertilizer on each side of the row it is desirable that the same quantity of fertilizer be delivered in each band.

The data presented in Table 3 is included for the convenience of those who desire to calibrate lime distributors. The method of procedure is exactly as described for the grain drill except there are no delivery tubes so the lime must be caught on a canvas.

The calibration of the drill may be conveniently checked during the field operations, where the dimensions of the field or the number of rows or drill widths required for one acre are known, by starting with a full hopper and weighing the amount of fertilizer required to refill the hopper after one acre has been covered.

No discussion of fertilizer dis-

tributors would be complete without mentioning the importance of cleaning the machine after each period of operation. Since commercial fertilizers contain salts, they have a strong corrosive effect on iron and steel. If fertilizer is allowed to remain in the hoppers it soon draws moisture from the air and the corrosion quickly starts. Furthermore, the fertilizer hardens and when the drill is next set in motion some parts of the mechanism may be either broken or forced out of place. Most of the cases of lack of uniformity in feeding may be traced to corrosion and hardened fertilizer. This may be avoided by never allowing fertilizer to stand in a hopper while the drill is not in use.

When a fertilizer destributor is placed in storage after the planting season, it is a good plan to apply cylinder oil or some other protective coating to all metal parts, particularly in the hopper. Some farmers have hesitated to do this for fear the oil might hinder the flow of the fertilizer when the distributor was used the next season. This is not the case. After a few weeks the oil will be so completely drained off that no trouble will be experienced. The control of rust, however, will be very effective.

| Width Machine and Wheel Diameter | Row Spacing | Pounds of fertilizer* which should be delivered by the full width of the drill per 20 revolutions of wheel to give applications from 50 to 500 pounds per acre. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 50 | 75 | 100 | 125 | 150 | 200 | 250 | 300 | 400 | 500 |
| 11 disc machine | | | | | | | | | | | |
| 47 inch wheel | 7 inches | 2.0 | 3.0 | 4.0 | 5.0 | 5.9 | 8.0 | 10.0 | 12.0 | 16.0 | 19.9 |
| 47 inch wheel | 28 inches | 2.2 | 3.3 | 4.4 | 5.4 | 6.5 | 8.7 | 10.9 | 13.1 | 17.4 | 21.8 |
| 47 inch wheel | 42 inches | 2.2 | 3.3 | 4.4 | 5.4 | 6.5 | 8.7 | 10.9 | 13.1 | 17.4 | 21.8 |
| 13 disc machine | | | | | | | | | | | |
| 47 inch wheel | 7 inches | 2.4 | 3.5 | 4.7 | 5.8 | 7.1 | 9.4 | 11.8 | 14.1 | 18.8 | 23.5 |
| 47 inch wheel | 28 inches | 2.9 | 4.4 | 5.8 | 7.2 | 8.7 | 11.6 | 14.5 | 17.4 | 23.2 | 29.0 |
| 47 inch wheel | 42 inches | 3.3 | 4.9 | 6.5 | 8.2 | 9.8 | 13.1 | 16.3 | 19.6 | 26.1 | 32.6 |
| 16 disc machine | | | | | | | | | | | |
| 47 inch wheel | 7 inches | 2.9 | 4.4 | 5.8 | 7.2 | 8.7 | 11.6 | 14.5 | 17.4 | 23.2 | 29.0 |

*Calculations are based on the planting of three 28-inch rows and two 42-inch rows with the 11-disc machine and four 28-inch rows and three 42-inch rows with the 13-disc machine. All calculations are corrected for a 10% wheel slippage.

Table 1. For calibrating grain drills to apply fertilizer for small grains or row crops.

| Type of Machine and Wheel Diameter | Row Spacing | Pounds of fertilizer which should be delivered by the full width of the machine per 20 revolutions of the wheel to give applications from 50 to 500 pounds per acre. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 50 | 75 | 100 | 125 | 150 | 200 | 250 | 300 | 400 | 500 |
| 4 row beet-bean drill | | | | | | | | | | | |
| 24 inch wheel | 24 in. | 1.3 | 1.9 | 2.5 | 3.2 | 3.8 | 5.1 | 6.4 | 7.6 | 10.1 | 12.7 |
| 24 inch wheel | 26 in. | 1.4 | 2.1 | 2.8 | 3.4 | 4.1 | 5.5 | 6.9 | 8.3 | 11.0 | 13.8 |
| 24 inch wheel | 28 in. | 1.5 | 2.2 | 3.0 | 3.7 | 4.4 | 5.9 | 7.4 | 8.9 | 11.9 | 14.8 |
| 40 inch wheel | 24 in. | 2.1 | 3.2 | 4.2 | 5.3 | 6.3 | 8.5 | 10.6 | 12.7 | 16.9 | 21.2 |
| 40 inch wheel | 26 in. | 2.3 | 3.4 | 4.6 | 5.7 | 6.9 | 9.2 | 11.5 | 13.8 | 18.3 | 22.9 |
| 40 inch wheel | 28 in. | 2.5 | 3.7 | 4.9 | 6.2 | 7.4 | 9.9 | 12.3 | 14.8 | 19.7 | 24.7 |
| 47 inch wheel | 24 in. | 2.5 | 3.7 | 5.0 | 6.2 | 7.5 | 10.0 | 12.4 | 14.9 | 19.9 | 24.9 |
| 47 inch wheel | 26 in. | 2.7 | 4.0 | 5.4 | 6.7 | 8.1 | 10.8 | 13.5 | 16.2 | 21.5 | 26.9 |
| 47 inch wheel | 28 in. | 2.9 | 4.4 | 5.8 | 7.3 | 8.7 | 11.6 | 14.5 | 17.4 | 23.2 | 29.0 |
| 2 row corn planter* | | | | | | | | | | | |
| 30 inch wheel | 40 in. | 1.2 | 2.0 | 2.6 | 3.3 | 4.0 | 5.3 | 6.6 | 7.9 | 10.6 | 13.2 |
| 30 inch wheel | 42 in. | 1.4 | 2.1 | 2.8 | 3.5 | 4.2 | 5.6 | 6.9 | 8.3 | 11.1 | 13.9 |
| 1 row potato planter | | | | | | | | | | | |
| 34 inch wheel | 36 in. | 0.7 | 1.0 | 1.3 | 1.7 | 2.0 | 2.7 | 3.4 | 4.0 | 5.4 | 6.7 |
| 36 inch wheel | 36 in. | 0.7 | 1.1 | 1.4 | 1.8 | 2.1 | 2.9 | 3.6 | 4.3 | 5.7 | 7.1 |
| 38 inch wheel | 36 in. | 0.8 | 1.1 | 1.5 | 1.9 | 2.3 | 3.0 | 3.8 | 4.5 | 6.0 | 7.5 |
| 40 inch wheel | 36 in. | 0.8 | 1.2 | 1.6 | 2.0 | 2.4 | 3.2 | 4.0 | 4.8 | 6.3 | 7.9 |
| 1 row cultivator | | | | | | | | | | | |
| 40 inch wheel | 24 in. | 0.5 | 0.8 | 1.1 | 1.3 | 1.6 | 2.1 | 2.6 | 3.2 | 4.2 | 5.3 |
| 40 inch wheel | 26 in. | 0.6 | 0.9 | 1.1 | 1.4 | 1.7 | 2.3 | 2.9 | 3.4 | 4.6 | 5.7 |
| 40 inch wheel | 28 in. | 0.6 | 0.9 | 1.2 | 1.5 | 1.9 | 2.5 | 3.1 | 3.7 | 4.9 | 6.2 |
| 40 inch wheel | 40 in. | 0.9 | 1.3 | 1.8 | 2.2 | 2.6 | 3.5 | 4.4 | 5.3 | 7.1 | 8.8 |
| 40 inch wheel | 42 in. | 0.9 | 1.4 | 1.9 | 2.3 | 2.8 | 3.7 | 4.6 | 5.6 | 7.4 | 9.3 |

*In the case of corn planters with 36″ wheels, multiply the weight of the fertilizer by 1.2. For row spacings of 22″, multiply the weight of fertilizer for 24″ row spacings by 0.92 All calculations are corrected for a 10% wheel slippage.

**Table 2. For calibrating row crop fertilizer distributors.**

| Diameter of Wheel | Width of Distributer | Pounds of lime* which should be delivered by the full width of the machine per 20 revolutions of the wheel to give applications from 1,000 to 6,000 pounds per acre. | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1000 | 1500 | 2000 | 3000 | 4000 | 6000 |
| 36 inch wheel | 6 feet | 29 | 43 | 57 | 86 | 114 | 171 |
| 36 inch wheel | 8 feet | 33 | 57 | 76 | 114 | 152 | 228 |
| 36 inch wheel | 10 feet | 47 | 71 | 95 | 143 | 191 | 286 |
| 40 inch wheel | 8 feet | 43 | 64 | 85 | 127 | 169 | 254 |
| 44 inch wheel | 8 feet | 47 | 70 | 93 | 140 | 186 | 279 |

*All calculations are corrected for a 10% wheel slippage.

**Table 3. For calibrating lime distributors.**

# Culling Cuts Costs

**Condensed from American Poultry Journal**

***G. S. Vickers***

CULLING, to be most effective, should be a constant procedure, for the quicker a cull is removed from the flock and disposed of, the less it costs to keep her. And by cull, we mean any bird that is not producing when she ought to be, assuming good care. This does not apply to hens in the fall, when even the good ones are molting, nor to pullets in the late summer and early fall before they have begun to lay. Culls here include sick or diseased birds, birds out of condition, and those which are out of production when they should be laying.

The right way to cull is always to carry a catching hook and take out the culls every time a trip is made to the laying house. Birds that are sick or diseased still eat, and may be sources of infection to the remainder of the flock. Non-laying birds eat, and the quicker they are sold, the lower the feed bills and the greater the profits. Furthermore, in the case of paralysis and associated troubles including blindness, the birds are still in good flesh and saleable in the early stages, and if culled and sold at this stage, have a salvage value, whereas if left in the flock, are ultimately a total loss.

Most people think of culling as going over the birds once in the summer and letting it go at that. However, it should be done every couple of weeks during the summer and early fall. The point of culling is to get rid of the non-producers as soon as they cease production in order to save the feed they would eat if kept. Ordinarily, starting in June, some birds go out of production, and through the summer and fall, more and more stop producing, until late in the fall and winter, very few old hens are laying except those few that molt and lay at the same time or those on which lights are used.

The whole basis of summer culling is that the early molters, or those that stop producing the earliest, are the poorest producers, and should be sold because they do not, with few exceptions, lay again until spring. The late molters and producers are the best birds because they lay all summer and during the fall, and hence lay over a longer period. They don't lay much in the late fall and winter either, but start

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in the spring as soon as the early molters.

Good poultrymen know they must depend largely on pullets for late fall and winter eggs. The above applies, however, only in flocks that have been properly fed and managed, and not to flocks fed only grain, or that have been moved, or that have had their feed changed, or that are out of production because of poor care and not because of being inherently poor producers. Also, it should be remembered that the better the breeding, the fewer culls will be found early in the summer. Ordinarily, those that stop laying before September 15th can be discarded.

Therefore, in summer culling, the most important thing is to be able to distinguish the layers from the non-layers. The comb and wattles are good indicators because an increased circulation of blood in the comb and wattles accompanies the functioning of the egg organs.

In the layers, they are full, expanded, glossy and red, although late in the summer and early fall they may appear a little more limp or wilted and smaller in size. In the non-layers they are small, dry and contracted and usually covered with a whitish scale or dandruff. These points are particularly noticeable in Leghorns, and for this reason they are often culled at night after they are on the roosts because they can be easily caught and handled to make certain.

The vent of the laying hen is large, moist and dilated, and tends to appear oblong in shape, while in the non-layer it is small, dry, puckered and contracted. The skin of the layer is usually loose, velvety, pliable and whitish in color when she has been laying for some time, while in the non-layers that have been out of production for some time, it is tight, rough and usually has a definite yellowish color in yellow skin varieties.

The pubic, or pine bones, located on either side of the vent, in the laying hen are wide apart, usually the width of two fingers or more, whereas in the non-producer they are close together, often no farther apart than the width of one finger. Also the distance between these pubic bones and the rear end of the keel bone is much greater in the laying bird. The distance between the pubic bones and that between the pubic bones and the rear end of the keel change as the bird is in or out of production, showing more space or distance when the ovaries are functioning and hence more feed being consumed. However, in heavy breeds carrying a large amount of flesh and fat this contraction when

production ceases may not take place because of the large amount of fat in the body.

Ordinarily, poor birds do not lay and molt at the same time, although there are exceptions, and when production ceases, molting generally starts. Therefore, in most cases it is safe to assume that those molting early are not laying. Molting starts on the top of the head and on the back of the neck, and as soon as complete molt starts, feathers are dropped on the back, breast, fluff and thighs, and new ones start to grow. The primary wing feathers are usually dropped in sequence, starting with the inside one or the one next to the axial feather, a short feather between the primaries and secondaries, and proceeding outward so that the last primary lost is the outside one. As these are lost, new ones start coming in so that the length of time a bird has been molting—and hence been out of production—can be estimated with some degree of occuracy.

The early molters, as a rule, drop their feathers more slowly than the late molting good producers, and hence require longer to molt. Also, the good producers lay quite a while after the molt starts, and often drop two or more wing feathers at the same time, thus requiring less time to molt.

One other aid is that of pigmentation which is of value in indicating whether or not a bird is laying and how long she has been laying. When a hen is not laying, the yellow coloring matter is stored up in the body and is observed in the skin, eyelids, earlobes (if white), beak and shanks, assuming that the ration contains green feed and yellow corn. If no green feed and no yellow corn or other similar pigment-containing feeds are in the ration, the pigment will not be noticeable.

When laying begins, this pigment bleaches or disappears, first from the skin as noticed around the vent, then from the eyelids, earlobes, beak and shanks in the order mentioned. When laying stops, this pigment again is deposited in the body and appears first in the skin, noticeable around the vent, soon after production ceases, then in the eyelids, earlobes, beak and shanks. Hence birds with yellow skin that have been out of production very long are apt to be yellow around the vent and around the face as noticed in the earlobes, eyelids and beak.

Where many birds are to be culled, it is quite a job to do it very often, and the necessary equipment such as culling coops should be available to make the job as quick and as labor saving as possible.

# Fertilize Your Lawn

*Dr. Howard B. Sprague*

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THERE are literally millions of home owners in humid regions of this country who struggle unsuccessfully each year with the problem of producing a creditable lawn. They begin the season with high hopes, engendered by enthusiastic claims made by vendors of seed, fertilizers, and other materials, and by the natural urge that creeps into the veins of every individual when spring arrives. By midsummer the home gardener has all too frequently given up the struggle to crab grass, drought, disease, or other ills afflicting lawns. The regrettable part of this situation is that most of the disappointment, the waste of effort, and useless expense could be avoided by a better understanding of the requirements for growth of lawns.

The average home gardener has far less opportunity than the farmer to acquaint himself with the requirements for growing grass successfully, and consequently must lean very heavily on the advice of those furnishing his supplies.

Although the plant-food requirements of lawn grasses are relatively simple, they are in many respects unlike those of trees, shrubs, and flowers. The native vegetation of humid regions is composed largely of trees, and the soils and climate are suited to such plants. The natural grasslands of the prairie country are neutral to alkaline in reaction, deep and well aerated, rich in organic matter and available nutrients. By contrast, our humid eastern soils are rather strongly acid, relatively shallow and compact, and low in organic matter and nutrients. In addition, many home lawns are built not on true soil, but on excavated material deposited at the surface during construction.

One of the first essentials in feeding lawns is to provide adequate drainage, both at the surface and through the soil mass. Reasonably satisfactory aeration in the upper few inches of soil is necessary, and this can be assured by incorporation of a suitable type of organic matter. On lawns already established upon soils of inferior quality, semi-annual top-dressings with loamy soil will gradually correct this defect.

Nitrogen is unquestionably the most important element required by grasses. However, the mere application of nitrogen fertilizers may harm rather than aid the turf, unless the proper supplements are provided. The most essential of these supplements are lime, phosphates, and potash. Contrary to a firmly entrenched prejudice, all lawn grasses make more thrifty and durable growth on soils properly limed, than on strongly acid soils. Careful experiments have shown that even the bent grasses, long supposed to be acid loving, are unable to effectively utilize nitrogen in the form of ammonia compounds under acid conditions. Thus, in one carefully controlled test, the introduction of additional sulfate of ammonia to a well-balanced nutrient solution with strong acidity (pH 4.5) reduced growth nearly one-half; while the addition of an equal amount of nitrate of soda increased yields 20 per cent. When the acidity of the nutrient solution was corrected, sulfate of ammonia had no such harmful effect, and was fully satisfactory as a source of nitrogen.

The significance of this principle lies in the fact that a great majority of lawn soils are strongly acid, and that a large percentage of commercial fertilizers supply nitrogen in the form of ammonia compounds. In using such fertilizers, it is necessary to correct any excessive acidity well in advance, by the application of lime. In general, 50 pounds of hydrated lime or 75 pounds of finely ground limestone per 1,000 square feet, will usually prove adequate for a 2-year-period. Moderate to strongly acid soils (pH below 5.5) are less satisfactory for grasses than mildly acid to neutral soils, due to the tendency of the former to produce a sod-bound condition. Acid soils are likewise less permeable to water, and thus greatly exaggerate the effects of droughts.

Too little attention has been paid to proper balancing of nitrogen with phosphates and potash. Since nitrogen fertilizers give the most spectacular response, it has been assumed that these other elements were unnecessary. Soils well supplied with phosphates and potash, on which the use of such minerals will show little response, are exceedingly rare on home lawns and similar turfed areas. Even pasture sods, developed on true soils rather than excavated material, generally display a great lack of minerals. In 1936, a group of 26 pasture tests located on a wide range of soils, averaged little more than half as much growth from use of nitrogen fertilizers as from nitrogen supplemented with phosphate

and potash. The use of complete fertilizers is important from the standpoint of the effect on type of growth produced. Nitrogen fertilizers alone tend to stimulate top growth at the expense of the density of the turf. Large amounts of clippings are produced without corresponding improvement in the quality of sod left below the cutting level. The following table illustrates this point.

| Treatment | Amount of clippings | Amount of tops below clipping level |
|---|---|---|
| No fertilizer | 100% | 100% |
| Nitrate of soda | 151% | 109% |
| Nitrate, phosphate, and potash | 164% | 137% |

The soil on which the above tests were conducted was relatively fertile; even more striking results may be expected on poorer soils.

Fortunately for all concerned, it has been shown rather clearly that plant nutrients supplied in *soluble* commercial fertilizers are entirely satisfactory for turf culture under most conditions. Reliance on such *slowly available materials* as bone meal, tankage, dried manure, etc., is one of the chief reasons for the astounding vigor shown by crab grass and summer weeds. Such organic fertilizers release plant nutrients during the hot moist periods of summer when crab grass thrives, rather than in the spring and fall months during which the permanent turf plants derive most benefit from fertilizer applications.

Lawns become green considerably earlier in spring and remain luxuriant for a longer period in fall with soluble commercial fertilizers than with organic materials. By applying soluble fertilizers in very early spring, and again in early autumn when summer weeds are disappearing, the desired turf grasses can be strengthened without danger of stimulating the summer pests. This type of fertilization, together with the adoption of a proper height of cut of 1 inch or longer, and reseeding with adapted grasses to repair injuries, constitutes the most effective method of controlling crab grass.

The following recommendations for feeding lawns have been devised for humid regions in the northeastern quarter of the United States, as the result of extensive tests conducted by the New Jersey Agricultural Experiment Station over a 10-year period.

Home gardeners frequently re-

quire advice on the need for uniform distribution of fertilizer over the lawn surface. Since fertilizers move downward into the soil and do not penetrate laterally, areas not actually covered by fertilizer derive no stimulating effect. Burning the turf with even the most concentrated fertilizers may be avoided by uniform distribution at a time when the grass leaves are completely dry. Applied in this manner, the material sifts through the leaves onto the soil, without injury to the turf. Artificial watering after fertilization is not essential where this practice is adopted.

Where the home lawn has failed, it will pay to inquire into the fertilizer practices. Turf grasses respond to rich, fertile soil, and will endure much harsh treatment if properly fed with available plant nutrients during the cool seasons of the year.

| Kind of soil | Fertilizer analysis | Amount to apply lbs. per 1,000 sq. ft. Early spring | Early autumn |
|---|---|---|---|
| Average to poor lawn soils | 5-8-5<br>5-10-5<br>4-12-4<br>15-30-15 | 10 to 20 lbs.<br>3 to 7 lbs. | 10 to 20 lbs.<br>3 to 7 lbs. |
| Fertile soils, well supplied with phosphates and potash | 8-6-4<br>10-8-6<br>10-6-4 | 5 to 10 lbs. | 5 to 10 lbs. |

# Thrifty Pigs

**Condensed from Capper's Farmer**

***Alex M. Gordon***

PAUL FISHER was in trouble. He liked the hog business, but hogs were not paying. Death losses were high, runts were numerous among survivors and it took too much feed and time to get pigs ready for market. Fisher is a man who knows when he has had enough, so he dropped hogs.

It proved simpler to quit than to find a substitute project that paid as well as hogs once had, so Fisher kept his ears open. He was ready to heed a voice in the wilderness if it offered salvation for hog raisers.

While he was out of the business, John Schwab, division of animal husbandry, Purdue University, held a meeting in Hamilton County, Indiana. The Schwab method of growing thrifty pigs, as outlined to Fisher and other farmers who attended, was simple. Briefly, it provided for well developed, vigorous breeding stock; a balanced, succulent, nutritious ration and an abundance of exercise for sows before and after farrowing; quarters that were warm, dry, clean, properly ventilated, free from drafts and dust; frequent careful personal attention to sows and litters, especially just before and after farrowing; control of parasites and filth-borne diseases by sanitation; a suitable growing ration for suckling pigs; a feeding program after weaning that would permit shotes to balance grain with pasture and a satisfactory protein supplement as their appetites dictated.

Before the meeting ended arrangements had been made for Schwab to hold a 2-day hog school to outline in detail methods for putting the plan into effect. Fisher attended the school and went home determined to carry out the plan to the letter. Today he is back in the hog business and proud of his record. One of the pig crops raised by Schwab's method consisted of 10 litters that averaged 2,074 pounds a litter at 180 days. The 10 Hampshire sows weaned 109 pigs and all reached market age. Ten litters that weighed 740 pounds more than 10 tons at 6 months! That's something to stir a man's pride!

The experience of Lee Long, of Miami county, Indiana, had been similar to that of Fisher when he adopted the Schwab plan in 1932.

**Reprinted by permission from Cappers Farmer, April, 1938, Topeka, Kansas**

He was still in the hog business, but he had to feed pigs until they were 7 to 8 months old to make them average 190 pounds. Mortality from birth to weaning date was heavy and percentage of runts high. The first year he used the Schwab method he sold late February and early March pigs in August and they averaged 200 pounds. While the depression still was on and hog prices were low, he paid off $4,700 in farm debts.

The man who can produce 200 pound pigs at 6 months has no complaint. Many Indiana hog men make higher averages. Jenkins Brothers, Orange county, made a litter of 17 average 289 pounds at 180 days. Arthur Wisker, Shelby county, produced two litters of 12 each in 1936. At 6 months one weighed 3,126 pounds and the other 3,120. The 24 pigs averaged 260 pounds.

One of the important features of the Schwab plan is the pig starter ration to be fed in creeps. It is composed of 70 pounds coarsely ground yellow corn, 20 pounds coarsely ground wheat and 10 pounds of 60 per cent tankage. Pigs will begin to eat it when 10 to 12 days old. Many hog men in Indiana are producing pigs that are twice as large at 10 weeks as any they ever raised before a starter was fed. The little porkers, like creep-fed beef calves, never lose their milk fat and weigh 40 to 50 pounds apiece when 60 to 70 days old. Some continue the pigs on the starter until they weigh 60 to 100 pounds, then finish them on pasture where they have access to shelled corn and tankage in self feeders. Schwab recommends that feeders, water and shade be close together.

Others vary the ration as feeds on hand and prices of those to be purchased may dictate. Thurman Lawler, Madison county, finished 66 pigs in seven litters with a full feed of corn, some ground oats, tankage and a little linseed meal. He made them average 228 pounds a pig, 2,150 a litter, at 6 months old.

Most of those who follow Schwab farrow their pigs in individual houses on clean ground. The few who use central houses scrub the premises with lye water and wash the sows before they are shut up. Later sow and pigs are hauled to clean ground, usually clover, alfalfa or bluegrass. Many like a spot sheltered by wood lot.

Floored individual houses, deeply bedded, are preferred. Guard rails keep young pigs from being overlaid.

The grain ration for pregnant sows that has given most satisfactory results is composed of 2 parts corn and 1 part whole oats

supplemented by 5 to 7 per cent tankage. Indiana Experiment Station tests have shown gilts 12 to 14 months old fed this ration weaned more than twice as many pigs as similar corn fed gilts. It is well to have water, feed and sleeping quarters for pregnant sows in three widely separated spots to force plenty of exercise. Sows are given access to legume hay in racks when not on pasture.

Care is taken not to overfeed sows just before and after farrowing. No corn is given at this time. Schwab recommends hand feeding equal parts of bran and middlings or ground oats, either dry or in a slop. The mineral mixture most commonly kept before sows and pigs is made of 10 pounds pulverized limestone, 10 of steamed bone meal and 1 of salt.

# Obtaining Soil Samples

*Donald M. Goss*

Associate Soil Classifier, N. J. Agri. Exp. Station

THE reliability of a rapid soil test depends to a large degree on the manner in which the sample is taken. The sample must be representative of the field to be tested, for then only will the test indicate the general fertility level of that field. Proper interpretation of the soil test is also essential before specific recommendations can be made. More accurate interpretations are possible when something is known about the physical condition of the soil, the cropping system, previous cultural practices, previous applications of liming materials, and the use of fertilizers and manure. A sheet furnishing the information desired should accompany each sample submitted for testing.

A composite sample consists of a thorough mixture of at least three equal portions of soil obtained from various parts of the field area to be tested. Each individual portion should represent from one-half to three-quarters acre and never more than 1 acre. The needs of this type of sampling is evident when one realizes that the results of soil tests, based upon the extraction of two to four teaspoonfuls of soil, are used as a guide for diagnosing one or more crop acres.

Separate composite samples should be taken:

1. When different soil types are found in the same field. This is shown by differences in color and texture. Light colored soils should not be mixed with dark

colored soils. Sandy soils should not be mixed with silty, clayey, or loam soils.

2. When parts of the field have been used for growing different crops or have received different applications of fertilizer, manure, or liming materials.

3. When parts of the field exhibit noticeable differences in plant growth. The differences in analyses of samples representative of good and poor areas in the field often indicate the trouble.

4. When the area of the field is greater than 10 acres.

*Time of Sampling*

The soil varies from day to day and from season to season; changes in temperature, moisture, and cultural practices cause marked changes in the nutrient level. Nitrates and ammonia nitrogen are the most variable. There is also a variation of soil acidity throughout the year, which in turn may affect the availibility of nutrients. The presence of a growing crop likewise affects the nutrient level of the soil, often causing low tests for many elements at the end of the growing season. Rainfall also affects the nutrient level of the soil. Low soil tests are frequently found immediately after heavy rains or after prolonged periods of leaching.

Samples taken in the late fall or early spring give the most reliable information concerning the need of fertilization or liming material for best crop growth. Soil samples tested during the growing season may give results more nearly comparable to crop abnormalities and may show the need of supplemental fertilization. When samples are submitted from fields on which crops are growing, a careful study of the plants should first be made to detect plant injury that may be caused by disease, insects, spray materials, weather conditions, or other factors. If such injury is discovered, fresh, well-packed plant samples should also be submitted with the soil samples whenever possible.

All the aforementioned factors must be taken into consideration when soil sampling is contemplated. The proper time of sampling depends, therefore, on the type of problem involved.

*Method of Sampling*

Soil samples, in general, are taken to represent the plowed layer. A soil auger or a soil tube is the most convenient tool for sampling cultivated fields, but where a small number of samples are to be taken, a small spade or trowel may be used.

*Sampling with the auger or soil tube.* Sampling with the auger or soil tube is accomplished by boring the tool into the soil

to a depth of 6 or 7 inches, or to plow depth, and drawing out with a straight upward pull. The soil thus obtained is then removed and transferred to a clean container. This process is repeated in other parts of the field until five or more borings have been obtained. These individual portions are mixed to comprise a composite sample.

*Sampling with a trowel or spade.* With the trowel or spade make a V-shaped hole 6 or 7 inches deep (plow depth). Clean out the hole thoroughly and then cut a thin uniform slice off the straight side of the hole from top to bottom and place the soil in a suitable container. Repeat the process in several other spots in the field, the number depending on the field area or section of field under consideration. You now have a representative composite sample ready for preparation.

When soils from permanent pastures, lawns, or other grass areas are to be tested, the sample should represent the zone of feeding roots. The depth of this zone is seldom more than 3 inches. A small trowel or a large knife may be used to obtain such samples.

*Preparing the Sample*

The sample should be spread out, as soon as possible, on a clean piece of paper to dry. Heat greater than room temperature should not be employed for this process. Care should also be exercised to prevent the sample from becoming contaminated with dust, fumes, or chemicals.

The dried sample should be crushed; foreign substances such as stones, twigs, and other fibrous material removed; and the soil thoroughly mixed. One pint of prepared soil is sufficient for shipment.

Before sending the samples make certain that each is carefully labeled and that the corresponding information sheet bears the same number as the sample. Keep a record for yourself of what each sample represents. Field diagrams assist one materially in locating the areas sampled and are helpful in taking samples of the same areas in the future.

# The History of Modern Hay Making

**Condensed from The Jersey Bulletin**

*Prof. Oscar Erf*
**Ohio State University**

IT was in the summers of 1907 and 1908 when complaints came into the Dairy Department of the Ohio State University from the Cincinnati region concerning the high mortality of infants which was blamed onto milk.

At that time, the principal system of dairying in the Cincinnati region, and in fact in most of the larger eastern cities, was the distillery slop feeding system for cows. Cows were purchased in the country, put into stables, and kept there and were fed primarily brewery and distillery wastes. When the cow was through her period of lactation, she was usually fattened and sold for beef. Some people began to complain about this system of feeding, and thought it was the primary cause of the high mortality of infants. Word had gone out that the milk produced from these feeds was toxic. Accordingly, a bill was presented to the legislature to prevent the use of distilled slops in dairies in the state of Ohio. Naturally, an array of attorneys attempted to prove that the practice did not produce a wholesome milk cow, on one side, while the defense attempted to prove that the milk was of superior quality.

Their arguments sounded scientifically reasonable, if the practice was followed out as they represented it to be. Later on, we began to make use of some of the products which brewery chemists had worked out in the feeding operation. At the time, no chemist could really determine any toxicity in the feed, and the bacteriologists were somewhat baffled except that they knew that cholera infantum, as it was termed then, was the cause of the disease.

At any rate, the bill passed, the dairies were removed, and the mortality was lessened, which we now understand was largely due to the unsanitary conditions that prevailed around these so-called distilled slop dairies, but we did not know at the time of the value of vitamins which we now understand were lacking in this milk.

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This same condition prevailed at the time in eastern cities. It was quite impractical to abolish the system of feeding industrial waste, for instance, around New York City, because it would eliminate a big supply of the milk that was needed at the time for this city. Milk, of course, was not used very extensively by adults in those days, except for cooking purposes. It was largely fed to children and infants.

Ohio was supplying a good many cattle for the eastern industrial waste-feeding dairies. Here and there, however, there came a demand for purebred cattle, and the Ohio breeders were anxious to supply these cattle at an increased price.

Of course these cattle were to reproduce and wherever they went into the eastern industrial waste dairies they apparently did not reproduce. Controversies between different breeders began to arise. In one of these controversies, we brought the cattle back from the east, after being fed in one of these stables for one year, which were good breeders in the beginning, and we saw no reason why they shouldn't continue to breed.

We found that these cattle did breed after they were brought back and fed with practically the same wastes, plus grass and hay.

We concluded that it was the pasture that was largely responsible for the breeding of these cattle.

A short time later a Jersey bull was sold in one of the large eastern sales at a very high price which, after being delivered to the owner, did not reproduce. Veterinarians examined the animal and found no pathological condition that they could determine. However, the animal failed to reproduce. It was the writer's privilege to be called upon to see what could be done to bring this very expensive animal back into reproduction.

After going over the history of the animal and finding that he had been kept in fine stables, had been fed mostly on timothy hay, some silage and meals consisting mostly of corn meal and middlings, we began to reflect on some of the experiences of the past, and we asked the owner for the privilege of carrying on some investigational work at his expense.

Dr. Scott, Ohio State University, was called in on this problem, and we proceeded to duplicate the experiences from the past. It was in February, 1909, and we began to sprout oats in order to get the green of the plant. We did not know of sprouted oats having any virtue along this line, as this was one of the earlier trials, but it was done largely be-

cause we could not get enough green material in the immediate vicinity from green houses to supply the needs of the bull.

As spring approached, we tethered him in fence corners where the early green sprigs began to grow. Not knowing much of the value of the early green sprigs, we were looking for what we then called the living cells, which we felt were somewhat responsible for those reproductive factors. We continued to pasture the bull, and on June 28 he successfully bred a cow and continued to breed for quite a number of years afterward, providing he was fed green material a part of the year.

What was it in the green that brought back the fertility of these cows, and particularly this bull?

It then became our privilege to receive a private donation to continue our work along these scientific lines. In the beginning, we attributed the cause of nonbreeding to the minerals of the feed, for upon analysis we found that the green grasses had usually again as much, and oftentimes more, of the minerals than ordinary hays and feeds did. However, upon supplying these minerals in equal quantities to that which are in the green grass, we did not get the results which we had anticipated, and we went further.

At this time Dr. Scott separated the green into two principal divisions, namely, chlorophyll and the fertility factor, which was later on defined. Later, we discovered by feed tests that it required the entire green of the plant to produce the fertility factor. The various separations that we had made in the laboratory all apparently proved to be toxic to rats. Then we began to extract the juices from the hays, and added them to milk for rat feeding. This proved to be a complete success from the standpoint of growth and rat development. We then tried to feed calves upon this material, especially during the winter months, and they made extraordinary growth, and it proved to be a wonderful feed. This indicated that our chemical separations were faulty.

At that time, an extract was made through triturating the hay and extracting the green with alcohol and evaporating the alcohol under sterile conditions, and we were able to preserve the paste in tightly stoppered bottles in refrigerators, so that it could be used for winter feeding.

We still did not know, after these trials, just exactly what was happening, but our next attempt was to remove as much as we could of the mineral salts, and we found that this apparently did not change our results, but that the fertility factor must

lie in the green combination minus some of the minerals.

Of course there was always an abundance of minerals in the milk, and we do not want to leave the impression that had we been able to extract all of the minerals salts, we would not have gotten the results that we have obtained, but we readily realized that the increased quantity of mineral was not the factor.

From 1913 to 1914 we labored under the impression that chlorophyll might have in it the fertility factor, but in order to check up our former work, we again began to feed pure chlorophyll with the celluloses, proteins, starches, fats, and minerals. We found in this work that we had increased the hemoglobin content in the blood, but it did not prove to possess the fertility factor. We had now traced it down to the green residue aside from chlorophyll, and we began then to again separate the green into two principals which were vague to us, but which we could somewhat identify chemically. But we did not know which one possessed the fertility factor, as both of them proved to be toxic when fed to rats. However, one gave us a decidedly favorable result. Later on, Dr. Frank M. Schertz, eminent plant chemist, rendered valuable assistance to Dr. Scott and Dr. L. E. Erf in defining and separating these substances into carotins and xanthophyls.

Some of the European investigators had been working with carotin in carrots some time before this, and showed the advantages of it in feeding by different methods of separation. No one apparently had undertaken to separate the carotin in the different green grasses, and upon repeated trials, we gradually found that the high percentage of carotin was in the young immature grasses. White clover and alfalfa are particularly rich in carotin, as well as blue grass. We found it largely in young timothy and in young wheat and barley. It is for this reason that we early began to attempt to promote pasturing and to improve the pasture grasses for cows.

As yet we did not know much about the physiological factors, but we did know that a young pasture grass was important. Hence, we began the system of mowing these pastures to keep the sprigs which were coming up, young, so that the cattle always had young grass. But upon repeated mowings, we discovered that animals did not do as well late in the season, as upon the early grasses. We found that the repeated mowings would reduce the protein, would decidedly reduce the minerals, and would lower the fertility factor.

Furthermore, we found that the acid content of these grasses began to increase and for the want of a better name, we called these "toxic acids." It was found later in some plants that an acid similar to prussic acid had developed. This led us then to liming and fertilization of these pastures after each cutting, which proved to be a successful method, especially when these pastures were limed and fertilized with a combination of nitrate of soda, phosphorus and potassium. We used gypsum with some success instead of lime, and used with it a small amount of potassium muriate, aside from the nitrogen-phosphorus fertilizers.

The great problem, however, was to feed these cows during the winter months. While with green grass apparently these fertility factors were abundantly accumulated in the body of the animal to serve their purpose for the balance of the year, we knew quite well that cows were kept in stables more and more, and pastures were more and more neglected.

The question came as to how these fertility factors could be maintained in the hay. We knew that as the plant grew to maturity, the carotin and xanthophyl were gradually reduced. So the problem of cutting young hay was one that gave us considerable concern, because of the impracticability of it. Since young hay was hard to cure, it decomposed easily in the field, and the carotins were more completely lost than in the hays that had a much lower percentage of carotin.

And so, after numerous suggestions and trials, we conceived the method of rapidly drying this hay with heat. Our first drier was simply a galvanized iron watering tank set on end; doors were provided in front, and shelves were put in the tank. Gas jets supplied the heat. The products of combustion from the gas went through the hay and were gradually liberated by a few small holes in the top of the tank with the moisture. We felt that gradually drying this hay at low temperatures gave us a complete recovery of the fertility factors. This was in 1917 when we thought we had effected a scheme of preserving these factors, knowing, however, that our apparatus was quite impractical for the average farmer.

We knew, however, that these things could be made practical, and hence made application to prove that drying hay such as we did in the tank, would preserve the fertility factors. We made application for a patent which later on was granted to us. We did not know, however, that

the products of combustion were so essential in maintaining the carotin and xanthophyl until a commercial drier was built which used hot air for drying. By this method of drying, apparently only 26 per cent of the carotin was recovered. Seventy-four per cent was lost against our method of 4 per cent. We then began to realize the necessity of introducing non-oxidizing gases through the hays while drying in the presence of moisture, because moisture and heat remove both carotin and xanthophyl rapidly. This is the reason why on a hot muggy day with a considerable sunshine, we lose the greatest amount of carotin in these hays, because the ultra-violet rays of the sun intensify oxidation— a slow process of burning. Then, again, came the problem of growing hay, because we found that in heavy rainy seasons we lose the carotin directly in the growth of the plant. In other words, grass grown in a saturated soil of water apparently can't gather enough nutriments or mineral salts to properly synthesize these carotins and xanthophyls into the hay, and it is at this time, also, that the acid content of the hay has increased.

Therefore, it becomes a problem that in some seasons that are extremely wet a system of fertilization must be applied from three to four weeks previous to mowing the young grass. So, to summarize the problem, we must have a good season. The hay must grow on a properly fertilized soil where there is a lot of organic matter, for it seems that we cannot intensify or increase the percentage of some of the minerals—particularly phosphorus—without having the phosphorus fertilizer mixed with a heavy organic soil. Then if the plants are cut early and dried immediately in the presence of non-oxidizing gases, it is possible to make a hay that has the fertility factors—in fact, has a great many additional nutrition factors —namely, the chlorophyll and the iron for the increase of the hemoglobin, the iodine to take care of the thyroid, the calcium and the phosphorus to take care of the rachitic conditions, etc.

There still remains the great problem of making this a practical proposition, and we have left this to the engineers to develop more economical driers, and to the more interested farmers to work out systems of growing and harvesting these grasses.

It is widely recognized today that the diet of the cow determines the vitamin A value of the milk, which is highest in early summer milk, when cows are on fresh pasture, and lowest on poor field cured hay and corn stalks.

It is now also definitely known, and has been quite thoroughly worked out by Dr. O. L. Inman, of Antioch College, that the value of the so-called carotins must necessarily be divided into alpha carotin, beta carotin, and gamma carotin, plus the carotinoids. Only beta carotin is of any value from the standpoint of reproduction, and is capable of being transferred into vitamin A in the body. Therefore, these carotins when taken into the body of the cow through hays are modified more or less, depending upon the breed.

For instance, the Jersey cow, as a rule, converts probably as much as one-half into vitamin A, leaving the rest in a modified carotin form, while the Guernsey has more of the carotin in the milk, and the Holstein-Friesian has a lesser amount, and more of vitamin A. The same thing is more or less true of the Brown Swiss, which, however, at times has more carotin than the Holsteins, and it is also true of the Ayrshires.

While most of the scientists have been laboring more on the protective side and the assistance in growth and the proper maintenance of nearly all of the endocrin functions, Dr. T. S. Sutton, Professor of Animal Husbandry, The Ohio State University, has taken up the physiological side, showing the nerve degeneration of the animal's system due to the lack of vitamin A, also showing the change of cells in the reproduction organs and cellular changes of the pituitary glands, indicating dietary injury to the reproductive organs, where this becomes a decided deficiency. This is probably the most comprehensive work from a physiological standpoint that has been done in the deficiency of vitamin A, or the absence of green as we formerly knew it. His experiences also indicate that there is less injury to the heifer than to the cow. There is more injury developing to the young male than there is to the mature bull. All these problems hinge more or less primarily on grasses and the green of good hays. The green contains the carotins in various quantities depending upon its growth and treatment. The carotins have incorporated the beta carotins which go into vitamin A, which is the important factor for reproduction. It must not, however, be assumed that in the green of the hay, it is the only factor. We still do not know what part xanthophyl plays in reproduction. While Dr. Sutton has fully determined that the lack of vitamin A produces castration cells in the reproductive glands which make for sterility, we still find in our experimental

work that apparently other factors which are in the green of the hay are necessary.

For human consumption most of the vitamin A is derived from butter and milk, but from a pharmaceutical standpoint, large quantities are derived from fish oils, which again are a form of carotin in the algae and sea weed which the fish consume and convert into vitamin A. These fish oils are extracted from the liver, where the vitamin A is usually concentrated, and due to the fact that they are fat soluble in oils, they are well preserved, which prevents oxidation.

However, it must also be recognized that vitamin A is digested and assimilated best when combined with oils or fats, and it is for that reason that young plants which have a higher percentage of fat, we believe, have a more digestible carotin. In fact, it is now believed that most of the carotins when mixed with feeds that are fairly high in oil—like corn meal, linseed meal, peanut meal, germ of wheat, or better, high potency or concentrated fish oils—are slightly better preserved if they are pretty well protected from the air. Great precaution must be taken in the mixing of carotins with ground feeds, or else they will be lost.

Fish oils that are not concentrated are toxic to the average cow and reduce her flow of milk. In fact, any of the feeds can be fed in moderate amounts to make the crude carotin more digestible. As a matter of fact, it is for that reason that we oftentimes use the hammer mill to thoroughly distintegrate the more or less matured hays to a fine pulp in order for the cow to get the greatest amount of carotin out of the hay. Old hay that is not finely reduced to a meal does not furnish much carotin for digestion. We had, therefore, in 1917 recommended the use of hammer mills for the disintegration of the fiber in these hays. Care, however, must be taken that this disintegrated hay is properly packed and properly stored, for as it comes in contact with air the carotin oxidizes rapidly and disappears. Ground hay loses its carotin very rapidly, if not properly stored in a cool, dark, dry place. Even the mixing of these dry hays with grains causes the loss of carotin unless it is properly packed.

Such a thing as spraying pure carotin or spraying highly potent fish oils into ground feed and allowing it to stand in the open, oxidizes the vitamin A rapidly. While carotins are more stable before they are converted into vitamin A, there is still a great possibility of considerable loss if not properly packed and stored during the season. We must ex-

pect a loss of approximately 50 per cent under average conditions between the newly made dehydrated hays and those that have been stored during the winter months until May. The greatest loss, however, seems to appear in March, April and May, probably due to the moist condition and the rising temperature at that time of the year. This loss, of course, can be lessened considerably by good packing in good reasonably air-tight bags and proper storage.

Hays allowed to lie around on the floor and in piles, lose the carotin content rapidly, in fact, most of it is gone in 30 days.

All of these seem to be impracticable problems, but like the new developments of any kind, as the feeders begin to understand these problems, they will see that they are not insurmountable.

## Hormones

Condensed from the Farm Journal

BY substituting very dilute indoleacetic acid, growth-producing chemical, for natural pollen, new wonders in plant breeding have been tapped by the recent success of Dr. E. J. Kraus of the University of Chicago and Dr. E. F. Gardner of the U. S. Department of Agriculture in producing both strawberries and holly berries.

Plump, firm berries were produced when the female plants had some of the acid sprayed on them with an atomizer. The berries lacked embryos.

By similar methods Dr. F. G. Gustafson (University of Michigan) has developed squash, pepper, tomato, and tobacco plants. Apples and beans deteriorated when treated, though the acid was highly effective when used as a fertilizer in stimulating root development.

Both female and male strawberry plants (the latter yield no fruit) are now used in producing commercial strawberries. Potentially greenhouse growers will use only female plants and at small cost set the fruit with a chemical spray.

It now costs eastern greenhouses from 3 to 5 cents a plant to transfer the pollen with small brushes from male blossoms to female holly plants. The expense would be a mere fraction as great if the indoleacetic acid costing but 2 cents a gallon were used. Copper sulphate has also been employed successfully in quite like manner with gooseberries.—*Dacy*

# What Are Fertilizers?

**Condensed from The Fertilizer Review**

FOURTEEN chemical elements are now recognized as essential to healthy crop growth. These are nitrogen, phosphorus, potassium, calcium, carbon, hydrogen, oxygen, magnesium, iron, sulphur, manganese, boron, copper, and zinc. When crops are removed from the land by harvesting, pasturing, or otherwise, there are taken from the soil the mineral and gaseous elements that combine to form the growing plants. In addition, erosion and leaching steal millions of tons of plant food from our farms each year.

If we burn the leaves, branches, stems, roots, seeds and fruits of crop plants, that part of their substance which is composed of carbon, oxygen, hydrogen, and nitrogen is transformed into water, carbonic acid, and ammonia (nitrogen), and passes off into the air in the form of steam and gases. The residue is the so-called "ash" of the chemist. It is the measure of the mineral depletion of the soil, and is made up of compounds of phosphorus, potassium, calcium, magnesium, and the other mineral elements named above, and also in some cases others in addition to those named.

Not all of these plant nutrients are of equal importance, but the depletion of the supply of them in the agricultural soils of the country is what lowers the level of soil fertility and makes necessary the addition of commercial plant foods, commonly called fertilizers, to preserve the productiveness of our farm lands for the benefit of this and future generations.

Commercially, nitrogen, phosphoric acid, potash, and lime are the most important plant foods. Hence our fertilizer industry has grown up and functions primarily to supply these nutrients. When symptoms of deficiencies of other nutrient elements appear as factors limiting crop production in any area as to any crop, the fertilizer producers have supplied the farmer's needs, adding to their appropriate manufacturing formulas materials containing the lacking elements.

Not long ago the fertilizer industry was largely a waste products industry. Materials used were, for the most part, organic by-products. The blood, bone,

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and tankage of the meat-packing industry, the fleshings and scraps of the leather industry, fish and fish scrap, the slops of the beet sugar industry, and the meal residues of the vegetable oil industry made up the greater part of mixed fertilizers. Today the industry is one of the largest units of the heavy chemical industry. Fertilizers now are carefully prepared mixtures of chemical compounds, assembled in accordance with definite formulas developed for specific crops and soils. Numerous organic by-products are still used as ingredients for special crops such as tobacco and citrus trees, but commercial mixed fertilizers are composed mainly of chemicals.

In the United States about 75 per cent of all fertilizer used is applied to the land in the form of complete or mixed fertilizers. The materials used in compounding such fertilizers are usually referred to as (1) nitrogen carriers, (2) super-phosphates, and (3) potash salts. Needed calcium is provided by direct use of lime and, incidentally, through the use of superphosphate which supplies annually the equivalent of more than 1,000,000 tons of lime in the total superphosphate consumption of an average year. Dolomitic limestone supplies both magnesium and calcium.

A particular grade or analysis of fertilizer is commonly described by numerals which show the percentage of each plant food contained therein. For example: 5-8-7 is an important complete fertilizer for many crops. These figures mean respectively 5 per cent of nitrogen (N) or, in one State, ammonia ($NH_3$); 8 per cent of phosphoric acid ($P_2O_5$); and 7 per cent of potash ($K_2O$). As each per cent of a ton equals 20 pounds, this grade contains 400 pounds of plant food.

The average plant food content of American mixed fertilizers, were they made up in a single mixture, would be about 4-9-5.5, a total of approximately 18.5 per cent. The average total plant food content of fertilizers used in Germany is about 22 per cent. Not that the figure has direct significance, but if fertilizers were used at the same rate of application in the United States as in Germany, our total consumption would be about 76,000,000 tons instead of 8,000,000.

Over 1,000 mixed fertilizer grades are made each year, an unnecessarily large number. For convenience they may be classed in the following groups:

1. *Low analysis fertilizers,* containing less than 14 per cent of plant food and considerable quantities of filler. These are uneconomic and have practically disappeared from the market.

2. *Normal analysis fertilizers,* containing from 14 to 23 per cent of plant food. These are made from standard materials, and the higher grades in the group contain practically no filler. Examples: 4-8-4, 4-12-4, and 5-8-7.

3. *High analysis fertilizers,* which contain 24 to 36 per cent of plant food. This group includes most of the so-called "double strength" fertilizers. (Examples 5-15-5 and 8-16-8.

3. *Super analysis or concentrated fertilizers,* which contain over 36 per cent of plant food. Examples: 10-16-14, 12-24-12, and 15-30-15.

In America the best fertilizer practice with most crops and soils calls for the use of complete fertilizers. Some soils are relatively fertile and may not require heavy applications; others may be deficient only in one or two plant foods, so that the use of one or two materials may be sufficient.

In contrast with complete, mixed fertilizers, which are compounded by the use of from 3 or 4 up to 12 substances, fertilizer materials usually contain only one of the major plant food elements—nitrogen, phosphorus, or potassium. A few materials carry two and a few even all three major nutrients.

Dozens of chemical compounds and organic materials have been provided by private enterprise for use in preparing complete fertilizers. Some, but not all, are suitable for separate application. They range in plant food content from 7 per cent of nitrogen in process tankage, through 20 per cent in sulphate of ammonia and 46.6 per cent in synthetic urea, and up to 74 per cent in diammonium phosphate (21 per cent nitrogen and 53 per cent phosphoric acid).

### *Nitrogen*

The United States is the largest producer in the world of by-product chemical nitrogen and of organic nitrogen carriers. It is the second largest producer of synthetic nitrogen. Germany stands first with respect to direct synthetic, and also with respect to cyanamide-producing capacity. As to the latter, Canada stands second.

No less than a score of nitrogen carriers are to be found on the market, ready for compounding to supply the farmer's needs. Sulphate of ammonia and nitrate of soda are typical standard materials and constitute the largest tonnages used.

### *Phosphoric Acid*

Phosphate rock, after conversion into superphosphate by treatment with sulphuric acid, is the leading source of phosphoric

acid in the world. We have the largest phosphate rock industry in the world, and have had since large-scale mining began in South Carolina in 1868.

In 1669 an alchemist named Hennig Brand, of Hamburg, discovered the element phosphorus. In 1835 Escher first suggested acid digestion of bone meal, and in 1839-40 Justus von Liebig, the father of agricultural chemistry, published the description of his process of preparing soluble phosphate with sulphuric acid.

In 1845 Sir J. B. Lawes, of Rothamsted, started the superphosphate industry, based upon his own patents and those of Sir James Murray, a Dublin doctor. In 1868 superphosphate manufacture, using rock, began in the United States, and with negligible exceptions in the earlier days of the industry our superphosphate industry has been the largest in the world.

Assuming the use of superphosphate containing 17 per cent of available $P_2O_5$, the average composition based on analyses of many samples made by the U. S. Bureau of Chemistry and Soils, is as follows:

**Average Composition of Normal Superphosphate**

| | |
|---|---|
| Moisture ($H_2O$) | 6.00% |
| Silica ($SiO_2$) | 7.00% |
| Gypsum and calcium sulphate ($CaSO_4$) | 49.80% |
| Monocalcium phosphate | 24.70% |
| Dicalcium phosphate | 7.50% |
| Iron and aluminum oxides and natural impurities, including fluorine | 5.00% |
| | 100.00% |

The mono- and dicalcium phosphates constitute the available phosphates. They total 32.2 per cent. The usefulness of the gypsum in superphosphate on some soils is well known. High concentration reduces the gypsum content both of superphosphate and of mixed fertilizer. In addition to its useful calcium content, gypsum added to a soil makes available some otherwise unavailable magnesium.

*Potash*

In the case of potash, five leading materials are available: Chloride or muriate of potash, sulphate of potash, manure salts, kainite, and potassium nitrate. The average commercial American muriate of potash contains 60 per cent of $K_2O$, while European muriate contains 50 and 60 per cent $K_2O$. Kainite which formerly contained 12.5 and 14 per cent $K_2O$ now contains 20 per cent. Sulphate of potash which is all imported contains 48 per cent $K_2O$ and manure salts 25 to 30 per cent. Nitrate of potash contains almost 60 per cent total plant food, of which 13.5 per cent is nitrogen and 46 per cent is potash.

# Prepotency

**Condensed from The Duroc News**

*Dr. O. P. Bennett*

THERE are a few questions connected with breeding that are of more importance than prepotency, but as is the case with many other related problems, it is only partially understood. Prepotency may be general, referring to a breed or species, or individual, as when applied to a given animal of a breed or species.

A prepotent breed is one which, to a marked degree, transmits certain breed characteristics to the offspring no matter how mated. A prepotent animal is one that transmits his or her characteristics, more or less distinctly, to its progeny; in other words one having a superior power over the other parent in determining the characteristics of the offspring. It is this direct and very marked influence, which prepotency has upon the improvement of live stock, that makes it of very great practical moment to all breeders.

A worthless animal, from a breeding standpoint, may be just as prepotent as a valuable one. In the first instance, he transmits his undesirable characters and qualities just as markedly as the valuable, prepotent sire, transmits the desirable. As it is only the animal of individually good quality, one capable of transmitting his desirable qualities and characters to his get, that is worth considering, it will be understood, for the sake of brevity, that such an animal is meant in our reference to prepotency in this chapter.

The prepotency of a breed appears most strikingly when two distinct breeds are crossed. The resulting get will have the characteristics of the one possessing the greater prepotency. This mating of two distinct breeds is a much greater test of prepotency than when a pure bred is mated to a mongrel or a cross bred, for in the former case there is a distinct clashing of two more or less prepotent breeds. Almost any pure bred is more prepotent than a mongrel or cross bred.

A number of examples could be sighted as to prepotency in a breed. In cattle, perhaps, the Galloways are the best example of it, for their progeny, no matter whether mated to pure or cross breds, are practically always black in color and hornless.

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Mention could be made of similar examples in various other kinds of live stock. The reason for this breed prepotency is largely the length of time in which they have been bred pure and the distinct characteristics represented by that breed. In the case of the Galloway, above mentioned, the black color and the absence of horns have been two of their most distinct characters. Both of these characters happen to be dominant in inheritance. A Shorthorn might be prepotent in impressing some of his form and flesh forming characters, but not his color to so great an extent, for color among this breed is not so distinctive, being either red, white or roan.

Individual prepotency is shown in the closeness of resemblance of progeny to parent, and, due to the same influence, the resemblance of progeny to each other. The greater the resemblance of progeny to each other the greater is the evidence of prepotency. This is particularly true if this resemblance in the get occurs though the sire or dam, which ever is under consideration, be mated to different individuals. The greater the diversity in the parent on one side, the resemblance still remaining the stronger will be the evidence of prepotency of the common parent.

It is well known, even to the novice, that not all parents are equally as powerful in transmitting their character to their get. In fact two animals, which look alike and are bred along the same lines, vary greatly in their power of transmission. Two litter brothers, having, of course the same sire, same dam and same ancestry, while resembling each other as much as any two animals can, may vary greatly in their ability to transmit. Avondale and Maxwalton Sultan, two good Shorthorn bulls, had the same sire and dam, Whitehall Sultan and Avalanche 2nd, and while the latter might have proven a good sire, he has never been spoken of as being in the same class as Avondale.

Prepotency is not limited to sex and may be present in either male or female. It is usually the sire, however, that is prepotent over the dam, and one reason for this is that the male is usually the better individual of the two and better bred. Many instances could be mentioned, however, in which prepotency is directly traceable to the dam, and sex in general probably has nothing to do with it.

As with breed prepotency, individual prepotency is undoubtedly due greatly to the length of time an animal's ancestors have been bred pure, without the introduction of any disturbing in-

fluences; where the desired characteristics and quality have been common to both sire and dam, grand-sire and grand-dam and great grand-sire and great grand-dam and so on, until these desirable characteristics have become so dominant as to overcome all influences to the contrary. The line bred and the inbred animals are the ones which are the most apt to be prepotent, due to the fact that their individual characteristics have been strengthened and made more dominant, and so impress themselves more distinctly upon the offspring.

It is thought by some and questioned by others, that individual vigor has much to do with prepotency, for the same reason that strength overcomes weakness; hence age, health and condition as it affects vigor, may influence it. Care and development also play their part in prepotency. However, an animal just fairly well bred but faultlessly cared for and developed may prove a disappointment as a sire, while one excellently bred but poorly grown and developed, may breed better than himself. The best animal of all is one well bred and perfectly developed, and, if such a one is a good individual himself and of maximum vigor, he has a chance, at least, of being a prepotent one. An animal from a prepotent sire or from a prepotent dam, from prepotent ancestry, is more likely to be prepotent himself than one whose ancestry was not so.

Certain animals are prepotent, if this is the correct word to use here, in transmitting the qualities of their ancestors rather than their own. Davenport has pointed out the well known fact that some animals (horses for instance) are breeders of performers, those who show speed themselves; others are breeders of sires, who although not speedy themselves beget it in their colts; others are breeders of dams whose offspring develop speed; while a very few are breeders of all three of the above. This may also be said of swine in regard to other characteristics than speed.

Prepotency in males is of particular importance because of the fact that they exert a much greater influence in the herd than does any one female. In selecting a sire, a breeder nearly always selects one that in breeding and quality is superior, in a general way at least, to his females. The fact that such a sire may be well bred, line or inbred, perhaps has much to do with his prepotency. The influence of a prepotent male on the get of any herd, is as great as the combined excellence and prepotency of all females is comparable to his. For the same reason his influence on the pro-

geny is also as much greater than that of the females as his excellency and prepotency exceeds this combined.

Marked prepotency is not of great frequency in any breed of live stock. Quite a few could be named in Standard bred and Thoroughbred horses and in Shorthorn cattle.

There have been a large number that I would call impressive sires, which perhaps would mean a limited prepotency, but few were markedly so.

There is no way known, at the present time, by which prepotency can be absolutely assured. The only thing for us to do is to continue to breed to the best of our ability, to be constantly on the look out for prepotency, to make our selections and matings so that greater excellency can be secured, practice such a system of breeding as will intensify and make dominant the desired quality, and when once an animal has been found prepotent, to make the best use of it possible. Unfortunately this knowledge is not always obtained until the individual has passed to the beyond, when much of the good he might have accomplished has been lost.

# Is Chick Sexing a Luxury?

**Condensed from Pacific Rural Press**

*Horace Dryden*

AS early as 1917 a few commercial hatcheries in the United States advertised and sold "day-old pullet" chicks. Various guarantees were made as to the accuracy of the sex selection, and although the method of "sexing" used is not known to the writer, it must have been about the same as employed in the present day. Usually there was no complaint from purchasers as to the accuracy of the operation, although it is said that one of the pioneers in the work on the west coast became involved in difficulties with the authorities for allegedly not being able to resist the temptation to sell cockerel chicks as "straight" chicks under a different hatchery name.

The early experience with "sexing" in this country, however, was a brief one. For one reason or another the original hatcheries that participated in the movement soon discontinued the sale of sexed chicks. One of the largest of these publicly stated that it did not consider the segregation of the sexes at hatch-

Reprinted by permission from the Pacific Rural Press, May, 1938
560 Howard St., San Francisco, Cal.

ing time practical as poultrymen hesitated to pay double the price for pullet chicks, the cockerel chicks presented too much of a problem of disposal, and the work of hatching and selling chicks was too greatly complicated by the additional task and detail of sexing them.

In Japan the sexing of day-old chicks was developed to a high degree of perfection and due to the fact that the Japanese are not substantial consumers of poultry meat as are the white races, and cockerels therefore are usually reared at a loss in Japan, practically all chicks that are commercially hatched in that country today are sexed at hatching time and the cockerel chicks destroyed. About 1933, Japanese "sexers" appeared in England, Canada and the state of Washington and impressed commercial hatcherymen with their almost 100 per cent accuracy in the sexing of chicks. Their work and the economic possibilities involved in it aroused a somewhat general interest among commercial poultry keepers and by 1934 and 1935 a large number of the commercial chick hatcheries in the United States were offering sexed chicks for sale and guaranteeing from ninety to ninety-five per cent accuracy. Sexing was confined almost entirely to the Leghorn breed.

At first some poultrymen feared that sexing damaged the chicks on account of the pressure exerted in the operation, but it has been demonstrated that if the work is carefully done by an expert it is not harmful to the chick. The best sexers will handle from 500 to 1,000 chicks in an hour and attain 95 per cent or better accuracy. Chicks should be sexed within 48 hours after being removed from the incubator, if possible.

Today the sexing of chicks is a normal activity of most commercial hatcheries and its economic implications, insofar as the commercial poultryman is concerned, are beginning to become clear. What are these?

In the first place, the sexing of chicks has not improved the economic condition of the average commercial egg producer. In fact sexing has probably made little if any difference in the important problems of commercial egg production. The financial lot of the egg producer has not and seldom can be improved by sexing, and for this reason many of the possibilities that were early expected of it have not been realized. However, sexing has a profound influence, and will continue to have, on the meat poultry industry.

Due to the fact that a large proportion of the cockerel chicks

must of necessity be destroyed during the heavy hatching months of March and April, prices of Leghorn broilers have been stabilized and prices of other poultry meats have been improved by the great reduction that has occurred in the movement of broilers and fryers into storage in the late spring months. By reducing these storage holdings of spring broilers and fryers, a cheap competition has been largely eliminated and the lot of the producer of poultry meat greatly improved. In fact, because about 40 per cent of the buyers of Leghorn chicks during March and April throughout the country buy sexed pullet chicks, the poultryman who continues to buy "straight run" Leghorn chicks is almost assured of making a satisfactory profit on the sale of the broilers. Many poultrymen are today finding it profitable to engage in the specialized business of producing Leghorn fryers for market throughout the year, an undertaking that would have been somewhat hazardous before the advent of sexing. Sexing, therefore, has created a new specialized industry.

The practical problem that confronts the individual commercial egg producer in deciding whether to buy or not to buy sexed Leghorn chicks is simply whether his financial position will be improved by sexing. Business principles must decide the issue if he is interested in profits. As long as a substantial proportion of the Leghorn chicks that are hatched during the spring months are sexed the evidence seems clear and does not brook argument that sexing is a "luxury" for the commercial poultryman and can be justified only from the standpoint of convenience and saving in labor and on no other grounds. And yet money can be made in the poultry business only through effort and the poultryman should attempt to add to his income from every possible source. Diversification and spreading of risk is a sound principle of business that applies particularly to poultry raising and there is some danger in making the commercial poultry enterprise too specialized.

Why is sexing a luxury? Simply because the poultryman has to pay for the cockerel chicks whether he takes them or not plus a charge of one or two cents for sexing and loses slightly because the sexing is not 100 per cent accurate. Because with an average price of 15 cents per pound for broilers and feed costing 2½ per pound the sale of cockerel chicks at eight weeks of age will pay the entire feed bill for both pullets and cockerels to

that time, and because if meat prices are more and feed prices less than these figures a handsome additional profit is made.

To produce a pound and a half of Leghorn broiler should require not more than 5 pounds of grain and mash total, or a feed expense per boiler of not more than 12 cents. If greenfeed is fed liberally, or if the chicks have access to range this cost will be slightly reduced. Brooder heat and litter will cost not more than two cents a chick and interest on investment and taxes not more than a cent, representing a total cost of producing the 1½ pound broiler, exclusive of labor, of 15 cents or less. If the 1½ pound broiler sells for 23 cents, the poultryman has made a 50 per cent profit in the short space of two months. What other branch of poultry farming offers the same opportunity? And what becomes of the argument that Leghorn broilers are always reared at a loss?

Studies of the economic effect of sexing applied to commercial egg production at some of the experiment stations have shown that the poultryman invariably will suffer a direct financial loss in having his chicks sexed and that the mature "sexed" pullet costs more than the "straight run" pullet.

Do baby pullets do better reared by themselves than with cockerels?

There is no experimental scientific data to indicate that they do. This argument in favor of sexing apparently is not founded on anything but somewhat superficial observation and undoubtedly needs more careful investigation. Our own experience, and we have watched the matter very closely for we are interested in rearing the best possible breeding stock, has been that there is little if any advantage in separating the sexes until eight weeks of age or until the cockerels start developing sexually. The important thing is simply the room allowed per chick, not whether the sexes are separated. The good poultryman will not crowd chicks of any age regardless of whether they are sexed.

In considering this matter of room in connection with sexing it must be remembered that room is not saved except during the first eight weeks or until the time at which the cockerel chicks would normally be marketed. If the poultryman who buys sexed chicks plans on using the same room for his pullet chicks throughout the first two or three months period without moving some of them to another building and broods only as many chicks as will have adequate room at that age then he is devoting a

great deal more floor space to the chicks during the first month than is actually necessary and is losing interest on his investment that might be gained through the "by-product" rearing of market broilers.

Granting that there may be some theoretical advantage in rearing the pullets separately from the cockerels, this is overbalanced by the fact that the poultryman has practically doubled his risk per chick by sexing, and that when accidents occur he has lost all pullet chicks instead of one-half pullet and one-half cockerel chicks.

From the standpoint of the hatcheryman sexing in most cases has proved a disadvantage rather than a blessing. Most hatcherymen would prefer to escape the added detail and labor of sexing inasmuch as it is seldom possible to show a profit on the actual sexing operation.

# Hay Choppers Find Year Around Job

**Condensed from Missouri Ruralist**

*George F. Jordan*

THE hay chopper seems destined to find itself among the favored pieces of equipment.

If more dependence is to be put in the hay crop as a feed, it will be necessary to make this crop as dependable as possible. And chopped hay is far more profitable to feed than hay put up in any other manner.

The return of the silo to the good graces of feeders likewise has made chopping hay something that will necessitate less outlay for machinery, for the hay chopper can likewise cut any green feed. Starting with alfalfa a chopper can start work around the middle of May and continue until winter.

The saving in barn room as well as saving of feed when chopped hay is stacked is still another point in favor of this new method of making hay. Loft capacity may be increased from 25 to 40 per cent by chopping. Incidentally chopped hay shouldn't be tramped, which means that two or three hands are escaping the irksome job of tramping hay. The chopper, thru its blower pipe, puts the hay where it should be.

When chopped hay is stacked in the open, a snow fence is the easiest method of holding it.

Reprinted by permission from the Missouri Ruralist, June 11, 1938,
2206 Pine St., St. Louis, Missouri

Three sections of snow fence make a stack about 15 feet across and from 12 to 15 feet high at the peak. Farmers who have chopped hay in the field say they can stack it in snow-fence as fast as it can be baled. That is, 4 men, a tractor for power and a team for a sweep rake can stack chopped hay as fast as a 7-man crew can bale it.

As to keeping qualities, chopped hay stacked in the open will have less spoilage than loose hay handled the same way. In the barn it is less likely to foster spontaneous combustion. It is easier to haul to feed bunks. There is less waste when livestock eat it. It is more palatable.

Getting back to choppers as a year-round piece of farm equipment, it is a common job for the chopper to "thresh" the oats crop. The oats are bound, then hauled to the chopper, the blower being placed in the top of the mow and the chopped oats directed downward. The heavy oats fall straight, the lighter straw falls to the sides. For feeding the grain it is as satisfactory as if the oats were threshed.

Still another use for the hay chopper is in putting up fodder. It has much in its favor that a shredder lacks. The main idea is to get the fodder chopped sufficiently fine so that in the heating process, when moisture rises to the top, this moisture will unite the surface of the pile to seal out the air.

With Red clover and soybeans, the chopper blows out much of the dust that ordinarily is found in such hay. Cutting Red clover stems is probably of more importance than cutting alfalfa stems, the former being on the average coarser. And for soybeans the cutting is even more desirable.

Still another feature of the hay chopper that also grinds the grain is that tests show about the same gain and finish can be put on steers by feeding chopped whole corn fodder for the first half of the feeding period and finishing with straight grain as can be done by feeding a straight grain ration thru an entire period of 90 days or longer.

# Protect Your Sheep

**Condensed from The Farmer**

THE steady loss of sheep, of wool, and of mutton from disease, is often brought about by the ever-eager army of parasites.

A portable sheep dipping outfit is the newest aid to controlling these destructive parasites. It consists of four principal parts, all easily assembled and taken down. A large galvanized tank is built onto an automobile chassis that is fitted with a short tongue. The tank is hauled behind a truck on which a draining rack rests when it is being transported from one farm to another.

Light but substantial loading and unloading chutes rest on narrow platforms alongside the tank when they are not being used. The same platforms serve as walks when men assisting in the dip submerge the sheep and see that none remain too long in the tank. It is a matter of no more than 15 minutes from the time the outfit reaches a farm until it is ready for use.

In moving short distances the dip is left in the tank. Otherwise it is drained into cream cans and loaded on the truck platform where it is free from dust and dirt.

The project in Pierce County, Wisconsin, was financed by the local Farm Security Administration. H. G. Seyforth, Pierce County agent, said that its completed cost was only $82.60. Last year co-operating farmers were charged 10 cents per head of sheep in flocks of less than 100, and 8 cents for larger flocks. The setup is more practical and convenient than dipping individually, and it saves a great amount of time. This year Manager Grant believes he will be able to drench each sheep at the same time that they are being dipped, at no additional cost. He will use copper sulphate or commercial bluestone. Completing two processes in the space of one effects an even greater saving of time. Sheep are not easy to round up, catch, hold, and treat as anyone who has worked with them knows.

The draining rack is a necessary part of the equipment when dipping is done on a large co-operative scale. More than a third of the solution drips out of the wool within a very few minutes, and if this can be caught on the floor and slanted back into the tank, a great saving is work-

Reprinted by permission from The Farmer, F. S. & H., St. Paul, Minn.

ed. The sheep stand on this drain rack for about three minutes.

Three hundred sheep have been treated in half a day with the Wisconsin outfit. More than 2,000 head were dipped in July alone, and in the entire year one-fourth of all the sheep in the county were dipped. Farmers are almost universally enthusiastic about the work.

*Note*: Any individual or county group wishing detailed plans of the portable sheep dipping unit discussed here may get them by addressing the College of Agriculture, Extension Engineer, University of Wisconsin, Madison, Wis. There is a charge of 10 cents for printing and mailing the blue-print plans.

In dipping sheep for lice and ticks certain precautions are necessary to observe before beginning. Lambs, bucks and ewes should be placed in the tank separately. The lambs are likely to be crowded under the surface and smothered. No sheep should be dipped that has a fresh wound or shear cut, particularly if an arsenic solution is being used, as poisoning is likely to occur.

When sheep have been sheared a few weeks prior to dipping, the longer wool will retain more solution and prove more effective in killing the ticks and lice. Animals should be kept in the tank for two minutes, and their heads pushed under for an instant one or two times. The water should be warm enough so that the sheep will not become chilled. Where nights are cool, every animal should be dipped early enough in the day to enable its becoming thoroughly dried. Every sheep should be dipped whether or not it is infested.

Of greatest importance, the water should be soft or treated with wood ash or sal soda until the dip mixes perfectly with it. When the oil congregates by itself it is apt to be too strong and may prove injurious.

Dips that may be used are coal-tar, creosote, cresol, nicotine, or any of the other good commercial dips on the market. In each case, wherever one is used, directions that accompany it should be carefully followed.

When complete eradication is desired, flocks should be given two dippings 14 to 16 days apart. This will usually kill all kinds of lice and ticks.

# Stop Coccidiosis!

**Condensed from Turkey World**

*Dr. Sivert Eriksen*

WHEN Turkeys get sick and die, most people think of blackhead. That is simply because blackhead has been the most discussed disease of turkeys.

Turkeys affected with coccidiosis act and look very much the same as if they were affected with blackhead. Certain forms of cholera and the usual infections of typhoid easily can be confused with coccidiosis. In other words, a sick turkey simply shows signs of sickness, and the symptoms alone are not sufficient to differentiate between blackhead, coccidiosis, trichomoniasis, typhoid and even leucocytozoon diseases.

One must make several kinds of examination, and one may have to end up with detailed laboratory tests before one can be sure of whether or not turkeys are affected with coccidiosis, either alone, complicated with other diseases, or some other diseases.

Bloody droppings is a very characteristic symptom of coccidiosis, and may be considered as almost a positive means of diagnosis. However, the disease frequently occurs without showing bloody droppings.

In studying the symptoms, the bird is killed. The skin is cut along the abdomen and peeled back so the breast and lower side of the bird are exposed.

The legs are bent back so they lay flat on the table. With a pair of scissors, the muscles on both sides of the breast are cut clear to the wishbone and the breast is bent forward over the neck. That exposes all of the internal organs.

The first thing we see after this procedure is the liver. If it is full of spots, we think immediately of blackhead. If it is greenish in color, we think of typhoid. If it is normal, it might be coccidiosis. We next lift up the gizzard, intestines and liver and cut away the peritoneum and mysentery which is the membrane that holds the intestines together. If we see the ceca large and distended, fully of gassy fluid, we think immediately of coccidiosis. If there are round spots of canker-like growths, we think of blackhead. The intestine back of the gizzard may be enlarged and swollen. Usually, if the portion

Reprinted by permission from the Turkey World, May, 1938, Mt. Morris, Illinois

back of the gizzard is swollen, the ceca are affected in lesser degree. When the ceca are opened, the contents appear to be semi-fluid and quite often show bubbly gas. The odor is not particularly offensive.

Cores may form in the ceca the same as in coccidiosis of chickens, but that is rather unusual in turkeys. If cores are present, they are apt to be as large as the ceca and more or less adherent to the lining. These cores are different from the cores of blackhead, as blackhead cores are fastened in ulcerous areas here and there in the ceca. These findings are sufficient to diagnose coccidiosis for the average turkey farmer.

If further proof is desired, a microscopic exclamation should be made. If round or oval, clear, small bodies are found under the microscope, the proof is positive. If swelling and rapidly moving objects are seen under the microscope, then the diagnosis is trichomoniasis. Blackhead is not easily diagnosed by means of a microscope. Typhoid is diagnosed by bacteriologic cultures and by antigen tests. Leucocytozoon disease is diagnosed by microscopic examination of stained blood smears.

As a rule, coccidiosis spreads through a flock rather rapidly, more so than blackhead, possibly somewhat less than typhoid. Sick, droopy turkeys with watery droppings appearing day after day in increased numbers are a very good sign of coccidiosis.

*What Is Coccidiosis?*

Coccidiosis is caused by very small animal parasites. They are measured in units of 1/2500 of an inch. They are complete animals in themselves. They live, grow and multiply in a very complicated sort of way. Part of the life of the coccidia is within the intestinal lining of the turkey, and that is where the damage comes to the turkey. All the rest of the life cycle is spent without damage to the turkey. The coccidia pass out with the droppings, go into a restive stage, and from then on are easily picked up by other birds that eat feed and materials that have been contaminated by the coccidia. That is how it is spread from one bird to another. It is not inherited, it does not hatch with the egg, and it isn't due to bad luck. Of course, it is bad luck when these coccidia get in.

Prevention of coccidiosis depends upon keeping the growing turkeys from becoming infested with these small animal parasites or coccidia. Keeping the brooder houses clean and dry, keeping the birds on clean range ground and moving them to a new location frequently, keeping the young

stock entirely separate from chickens or other kinds of poultry, and care to avoid carrying infection to the flock on shoes or equipment, are the main points to observe in preventing coccidiosis from getting into the flock.

When a flock shows signs of coccidiosis, one should start treatment of the entire flock right away. There may be other birds in early stages of coccidiosis that will never show signs of sickness, if they are treated before the coccidia have had time to grow in large numbers. The birds that are nearly dead are quite often too far gone for treatment.

In treating coccidiosis, we have in mind the entire flock and not the hopelessly sick bird. First, give a mild laxative; second, begin treatment with a reliable medicine to help constrict the blood vessels to avoid bleeding, and to check diarrhea. Medicines may also help to retard the development of coccidia in the bird. Medicines may also help to stimulate the appetite, so the bird will eat better and carry on its normal nutrition during illness. When the bird recovers, it is immune and that is why it is worthwhile doctoring the sick flock. Third, after the laxatives and medicines have been started, move the turkeys to clean ground, and, if possible, move them uphill rather than downhill. Get them on dry ground and dry litter.

Since coccidia are not capable of causing disease when they are first passed out of the body of the sick bird, but must spend about three days outside of the body before they become infective, moving away from them will practically eliminate new infection. In other words, moving the brooder house or range equipment to a new location every few days will leave all of the infective coccidia behind, and for this reason, few new cases will develop. This same principle can be applied to handling the brooder house litter. Removing the litter every other day will carry coccidia out of the brooder house before they have time to develop to the point where they become capable of causing the disease.

Another method of handling the litter problem can be followed. If a highly absorptive commercial litter material is used, and the litter can be kept very dry, the development of the coccidia is retarded, and it is not necessary to remove the litter so frequently. In fact, it can be left in the house almost indefinitely, *as long as it can be kept dry.* If it gets damp or wet—then look out. Clean it out and replace with new litter before trouble starts. Moving frequently to new range

and changing the litter frequently, or the use of a highly absorptive litter, are good practices for the prevention and control of coccidiosis, but the disease is often very persistent, even with the best practices of sanitation. Other means must often be used to bring it under control.

Spraying and treatment of the litter may help to check the sporulation of the coccidia. Put drinking vessels on wire stands or on coarse gravel.

As a nourishment, milk is good. If milk is given, other proteins in the feed should be reduced. Milk is not a cure for coccidiosis but simply an easily digested nutriment, the same as it is for sick humans.

Coccidiosis cannot be prevented entirely by medication, but treatments every three or four weeks will often help to keep coccidiosis in check and will aid in preventing sporulation. In the treatment of human diseases, medicines have played a very important part from the beginning of the human race up to the present time.

Medicines should therefore not be ignored in the tratment of turkeydiseases including coccidiosis. At the same time, one must be very careful in the selection of medicine, because so-called medicines may be entirly worthless. One must use as good judgment in the selection of medicine as one does in the choice of feeds and everything else. There is no substitute for good judgment.

# Power from the Wind

**Condensed from Dakota Farmer**

*Frank J. G. Duck*

A best seller, the popularity of which continually is increasing in areas remote from power lines, is the windmill-type of electric generator, used to provide lights, operate a radio and run numerous household appliances powered with small motors.

Available in 2, 6, 12, 32 and 110-volt types—all of which require storage batteries in their operation as they supply direct current and there often are periods when no wind is blowing—these machines essentially comprise an automotive-type generator of special design fitted with an airplane-type propellor and some form of governing mechanism.

Although these plants can be built at home, it is best to purchase one of the several excellent

Reprinted by permission from the Dakota Farmer, Dec. 4, 1937.

factory-built units now on the market, unless a person is possessed of more than average mechanical skill and ingenuity.

It should not be assumed that wind-electric plants will work equally well in all locations or that they can be installed without planning. Several important factors must be given careful consideration, the first of which is the prevalence and velocity of the wind. In other words, there are certain general areas and numerous local districts where the average wind movement throughout the year or during the summer months is so low that a steady and reliable supply of power cannot be developed by a wind-electric plant alone. Under these conditions, a small "stand-by" engine-driven unit—which can be put in service when the wind fails—is imperative.

Therefore, before purchasing a wind-electric plant it is advisable to know the average wind velocity and the average wind movement per month for your territory for the past ten years. These figures can be obtained from the nearest station of the United States Weather Bureau or, perhaps, from the engineering experiment station of your state college or university. From them, you can determine with reasonable accuracy whether or not there is sufficient wind at all times of the year to insure satisfactory operation of such a plant which begins to generate in winds of from 4 to 7 miles an hour.

The next step is the proper location of the wind-generator with respect to your home, outbuildings and surrounding trees and hills. The plant must be installed so that there is an unobstructed sweep of wind from all directions. It must be 10 to 25 feet higher than any object within 400 feet, and at least 800 feet from any obstruction which is higher than it. If the tower regularly supplied with these plants—about 10 feet high—is not tall enough, well-built steel sections are available from the plant manufacturer in convenient lengths at nominal cost, with which it is possible to erect towers to as great a height. Where a sufficiently-high and well-built windmill tower is available, it can be used to support a wind-electric plant by installing the proper adapter.

Wires from the generator to the storage battery should be as short as possible and must be of sufficient size to prevent an abnormal drop in voltage. This is particularly important with the 6-volt unit, where a drop of 2 volts means a loss of 33%, compared to losses of but 6 and 2%, respectively, for a like drop with the 32- and 110-volt outfits. For this reason, the wind-generator

preferably should be located within 75 feet of the battery and, under no circumstances, at a greater distance than 250 feet.

With a 6-volt outfit, the recommended wire sizes between the generator and battery are as follows: Under 50 feet, No. 8 copper wire; from 50 to 100 feet, No. 6 copper wire; from 100 to 250 feet, No. 4 copper wire. Slightly smaller wires may be used with a 32-volt unit, and still smaller with a 110-volt machine. However, too-small wires must be avoided and you should be guided by the manufacturer's instructions or the advice of a competent electrician.

Do not use automobile batteries. Use radio or farm-light types, the larger the better. Where a 6-volt wind-electric machine is used only for radio, a single large 140- or 200-ampere-hour storage battery (the size depending on the locality) will be sufficient. If local wind conditions permit the use of lights in addition to a radio, a 240- to 400-ampere-hour battery should be used. This can be obtained by connecting two smaller batteries in parallel, i. e., by connecting the two positive and the two negative terminals together. Remember that larger batteries are more economical because of their longer life and that, also, they give better service.

For 32-volt outfits, it is necessary to use 16 two-volt glass-jar storage batteries. With 110-volt units, 56 cells of the same type are required. The size of the cells will vary with the locality and the electrical load.

If you live in a low-wind area, a 6-volt plant will provide only enough current for a radio. But if you live in a high- or medium-wind area, there also will be sufficient current for small lights—though only a limited number in the latter case.

For many reasons, it is impracticable to operate large numbers of lights or any household appliances with a 6-volt or 12-volt outfit. Hence, the 32- or 110-volt units are required where greater use is to be made of electricity. These sets, with which it is possible to operate many pieces of household equipment—excepting a range, water heater and similar large devices—are subject to the same general qualifications concerning high-, medium- and low-wind areas as is the 6-volt wind-electric plant. That is, the number of appliances which can be operated simultaneously will vary with the wind and the capacity of the batteries.

The initial cost of a wind-electric plant varies widely, depending upon its voltage, the battery capacity provided, the height at which it must be installed, the

amount of wiring required and the distance the service man must travel. The least expensive 6-volt unit, complete with battery, can be installed by a farmer himself for as little as $30.00. However, the average 6-volt plant—assuming installation by a service man—will cost about $70.00 and may run as much as $110.00, the principal difference in cost being the batteries.

A 32-volt outfit, installed complete with batteries, can be purpurchased for about $225.00. But the average cost, with a larger set of batteries, probably will approximate $375.00 and may be as high as $550.00. Primarily because of added battery expense, the minimum, average and maximum cost of the 110-volt unit will be about $400.00, $625.00 and $900.00, respectively.

This—the high battery cost—is the principal reason why the 32-volt outfit is preferred by the majority of farmers. On the other hand, appliances for operation at that voltage generally cost more than those built for 110-volts—in fact, many are available only for the higher voltage. Then, too, 32-volt equipment would be valueless should high-line power become available at some future date.

As the only necessary supplies are lubricating oil and distilled water, the power operating cost of a wind-electric plant is very low, varying from 50 cents to $1.00 per year. However, to this figure should be added repairs, depreciation and interest on investment. Assuming an average life of 10 years for the entire plant (that of the batteries will probably be shorter; of the plant, longer), and figuring interest at 6%, the gross operating cost will vary from slightly less than 2 cents a day for the smallest unit to about 41 cents per day for the largest.

*Advantages and Disadvantages*

When compared with an engine-driven home electric plant, the wind-electric unit has the following advantages: No fuel cost; practically no routine attention; absence of noise, vibration, grease and odors which often accompany the installation of an engine-driven plant in the basement. Its principal disadvantages are higher overall first cost; limitation of generator output by available wind; greater cost per kilowatt-hour of electricity produced; larger battery capacity required; exposure to weather; including damage by high winds.

# If Home Granaries Harbor Insects

**Condensed from Kansas Farmer**

IF moisture increases insect attack, the first step in protection is to store the grain as dry as possible. Put off harvest until the grain is ready, store damp loads where they can be moved, or spread the grain out as much as possible.

Clean bins are the second requirement for protection against insects. Many farmers are careful to clean and disinfect their bins each year.

Third precaution, which can be followed by the man who stores grain, is to inspect it occasionally and if heating has begun, stir it by moving or any other means which will do the job of getting air to it.

For some reason, the activity of insects working on grain causes heat. Dr. E. G. Kelly, Kansas State College, told recently of cases in which grain in zero weather was heated within arm's reach of the surface to such a degree that one could not hold his hand in it. Therefore cold weather isn't protection against insects. However, moving the grain in extremely cold weather gives it an excellent chance to cool.

The final step in insect protection is fumigation, and it is the most important if it becomes necessary. Warm temperatures are required. Eighty to 90 degrees are best, and the work will not be successful if the grain is colder than 65 degrees.

"For treatment of infested wheat or corn in storage on the farm," reports the latest bulletin of the Department of Agriculture, "there is nothing cheaper, more effective or more readily available than carbon disulphide."

Although the fumes of carbon disulphide often are inflammable, this fumigant can be handled with reasonable safety. It should not be used to treat bins located in barns where the fire hazard cannot be properly controlled and where a fire or explosion will endanger human life or lead to losses of farm animals, farm equipment, buildings and stored crops. It is well adapted, however, for the treatment of grain storages that are segregated from other farm buildings. The fumes of this gas are quickly absorbed by the grain after it is applied and the danger from fire or explosion is not prolonged.

Insects which are most likely

Reprinted by permission from the Kansas Farmer, July 2, 1938, Topeka, Kansas

to bother Kansas grain are the cadelle and the dark and yellow meal worms. The larvae of the cadelle have the habit of burrowing into the woodwork of bins. They may remain there and only come out when fresh grain is put in the bin. These larvae are chalky white, with black heads and two horny black points at the other end of their bodies They are ¾-inch long when grown. About the only insurance against them is thorough cleaning of the bins and fumigation of the newly stored grain.

The same treatment is good for the meal worms and other insects which might infest granaries in Kansas.

Fumigation is a practice which should be done carefully and exactly. The following items cover the subject briefly:

1. Be sure the grain bin is tight. Double siding is necessary to prevent considerable loss of the "heavier than air" fumes of gas. A metal or masonry bin, tight at sides and bottom, is fine for fumigation. A good roof prevents some escape of the gas.

2. Apply carbon disulphide at rate of 1 to 3 gallons to 1,000 bushels of grain. If temperatures are warm and the bin is tight, the smaller quantities of the liquid may be used.

3. Apply by sprinkling over the surface with a watering can or sprinkler, or place in shallow pans. Do not open the container and bury in the grain. Best results are from applying the liquid in layers, but this is less necessary in the better bins.

4. Leave the bin immediately after applying the chemical and do not breath the fumes if you can help it.

5. Keep fire away from the bin until fumigation is complete.

6. Buy carbon disulphide in bulk at prices in the range of 6 cents a pound for 500-pound lots.

7. Use chemicals other than carbon disulphide only after carefully consulting reliable instructions.

# Certified Grimm Alfalfa

Condensed from The Indiana Farmer's Guide

UNIVERSITY tests in all parts of the country continue to prove the importance of good seed for greatest profit. This fact has had much to do with placing the raising of pedigreed seed on a par with raising pedigreed stock.

The importance of true-to-type varieties is particularly noticeable in perennials, like alfalfa, where most of the profit comes from years following the first planting. And this importance is increased with severe climatic conditions that tend to winter-kill weak plants, thus seriously reducing profit possibilities. Climates that demand a hardy variety produce most profit when the planting is done with pedigreed, state-certified, accurate as to grade and variety seed.

Such a climate is that of the uplands of Southeastern Idaho. Because of the severity of the climate, an altitude of 4,500 feet, and possible frost eleven months of the year, the hardy alfalfa variety, Grimm, was tried out in that area some 25 years ago.

Not only did Grimm prove its worth as a hay crop that wouldn't winter-kill while producing record yields, but the territory itself proved that it was peculiarly adapted to the raising of seed. As a result, these Idaho uplands are today one of the most important Grimm alfalfa seed centers of the country.

But Grimm, like any variety of any crop, will deteriorate and weaken unless cultivated with the care and selection accorded the finest of pedigreed stock. To this end, the State of Idaho and its seed commissioner play an all-important part. Acting in co-operation with the University of Idaho Extension Division, the Department of Agriculture and state departments of other states, the office of the state seed commissioner compiled a set of rigid rules and regulations concerning the raising of alfalfa that could carry the official Idaho State Certification as to quality, variety, freedom from noxious weeds, and other points of perfection so important to the raising of profitable crops under severe conditions.

The requirements for registering a field for the raising of certified Grimm alfalfa seed are many. First of all, the field must be planted with Grimm seed, certified, sealed, and tagged by a representative of the Idaho State Seed Commissioner. The field

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planted must be clean, that is, planting must follow sage brush, or two years of cultivated crops.

No chance is taken on cross-pollenization with non-registered fields or other varieties, for the registered Grimm field must be the only one grown on the farm for seed purposes. It must be at least 4 rods from other fields of non-registered alfalfa, and the non-registered fields must be cut for hay before there is any chance of seed formation. If a registered field of Grimm is on line with a non-registered or other variety field on an adjoining farm, a strip of 4 rods wide must be cut for hay on the registered field, unless the adjoining field is cut for hay.

Inspections by authorized Idaho seed inspectors are required. The first, or seedling inspection, is made in the month of May the first year to determine the presence of old alfalfa plants. Another inspection later in the year is made to determine trueness to Grimm variety, while still a later inspection is made to detect the presence of noxious weeds and sweet clover. This last inspection is made annually and fields that show noxious weeds or an excess of sweet clover are eliminated from certification. That is, seed from such fields cannot be certified.

Not content with supervising the growth of Idaho Grimm alfalfa, the office of the state seed commissioner continues its regulation until the seed is on its way to market. It does this by sealing the Grimm seed in sacks at the field when it is threshed. Authorized representatives later unseal it at the authorized cleaning plant, where it is cleaned and graded. And as a final step to prevent the mixture of inferior seed with the carefully grown and pedigreed Grimm, the deputy seed inspector is on the job and seals and labels with the certifying tag each sack of seed that deserves the label.

There are four grades of Idaho Grimm alfalfa, denoted by purple, blue, red, or yellow certificates. Purple is especially recommended for seeding purposes. Blue is the Idaho Fancy; red is the Idaho Choice, and yellow is the lowest grade that deserves certification. Purity, grade, and variety are plainly marked on the tag and certified as true by the office of the Idaho State Seed Commissioner. One can see how Grimm alfalfa raised under the above rigid conditions is truly a pedigreed Grimm. In fact, the elaborate and complete records of the state seed commissioner can trace every registered Grimm field clear back to the original importation of Grimm alfalfa into Idaho.

Because of the favorable natural conditions, there has grown up in Idaho one of the strongest and highest recommended co-operative associations of seed growers in the world. It is known as the Idaho Grimm Alfalfa Seed Growers Association, and is composed of over 600 growers who market their fancy certified Grimm alfalfa seed under a common brand.

# Texas Screw Worm Fly

**Condensed from Farm and Ranch**

*B. L. Henderson*

THE Texas screw worm fly is a major problem for ranchmen in that this insect causes an annual loss of 8 to 10 million dollars. The United States Department of Agriculture, thru the Experiment Stations and other educational services, has made great progress on the control of the screw worm fly.

The United States Department of Agriculture, Bureau of Entomology, has released information relative to the treatment of the screw worm cases which is available in bulletin form. An application of a safe, economical repellent and healer is recommended on all fresh cuts and wounds, which in turn reduces the possible number of screw worm cases.

When the ranchman finds a case of screw worms, he should be prepared to give the animal immediate skillful attention. Benzol is recommended to kill the larva. Before it is applied any discharge from the animal should be thoroughly cleaned from the wound. The wound should then be carefully swabbed with cotton, a light application of commercial benzol made and allowed to stand three or four minutes. This operation is primarily to check the flow of the discharge. A second light application is then made and dry cotton is inserted in the wound immediately. The fumes from the benzol are inhaled by the larva and this is what kills, so give the screw worm sufficient time to breathe the fumes. It is recommended that the cotton plug be left in the wound until the next treatment. Many ranchmen have the opinion that if a small amount of benzol is effective, a little more will kill quicker, or a sure-shot. This is not the case, as it is the fumes or gas that kills. Immediately after the second light application of benzol, apply a coat of bone oil over the cotton plug and the skin

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around the wound to repel the flies and heal the wound. Treat the wound with bone oil every four or five days until healed, but in case there is a bloody discharge following the first treatment, repeat the benzol treatment, and follow with bone oil smear again.

Bone oil is a complicated product made from the distillation of bones for bone coal. Bone oil is a tar-like, black organic mixture of antiseptic and repellent elements and is extremely adhesive to the skin on wound surfaces. It is used extensively as a healer of fresh cuts, such as shear cuts, docking, castration, dehorning, etc. The pungent odor is very effective as a fly repellent, thus it is a safeguard against myiasis, a disease infected by the fly larva in and on the body of the animal.

Messrs. W. H. Dameron and O. G. Babcock, Entomoligists at the Sonora Experiment Station, made the following observation as to the efficiency of bone oil in comparison with pine tar oil. Calves were dehorned on June 10, 1936, and the group treated with bone oil had twelve cases of fly blows, six cases of screw worms and received twenty-five applications of the repellent. The group treated with pine tar oil had thirty-three cases of fly blows, ten cases of screw worms and received thirty-two applications of the repellent.

Every screw worm killed in the wound of the animal is a contribution to an effective control of the screw worm fly. Thus if the larva is killed and fresh cuts and wounds are treated with an efficient healing repellent, the breeding places of the fly will be eliminated to a great extent, therefore the number of adult flies will be reduced. Another precaution on the control of the screw worm is to eliminate unnecessary hazards that inflict wounds in the animal, as the screw worm fly most always lays its eggs on fresh blood from living tissue.

# Ginning and Storage of Cotton

**Condensed from Southern Agriculturalist**

*J. E. Stanford*

COTTON must be dry when bulked, or the lint will be damaged. If picking is started while cotton is damp from dew, the cotton must be spread out in the sun and dried, or the quality of the staple will be lowered. The cotton drier is solving this moisture problem at an increasing number of gins and is making money for farmers who patronize gins so equipped. Where a drier is not available, natural methods must be used if the full value of cotton is to be secured.

The cotton house helps in producing quality lint. In a properly constructed house, cotton is protected from rain, dirt, stain and trash on the ground. It also helps the ginner to better distribute his work and to turn out a better bale with less damage to fiber. A mistake is being made in not building more up-to-date cotton storage houses in the fields.

Not nearly enough thought has been given to the operation of the gin. Millions of dollars are lost to cotton producers by faulty ginning. The object of ginning is to remove the seed from the fiber with a minimum of damage to the latter and at the same time put the cotton up in neat and well protected bales. Gin saws must run at the correct speed, and breast roll must be run loose to avoid damage to the lint. In tests made by the Texas Experiment Station it was found that 760 revolutions per minute was about the correct speed for the air-blast type of gin that was used. This cleaner improved cotton value two grades by the removal of trash, dirt and other foreign material.

Correct speed for gin saws and proper adjustment for breast roll should be determined, and then these should be adhered to even if wagons are standing in line. Ginners might well urge the building of more cotton houses so that they can take time to do better work in their plants.

The capacity of the gin should not be so crowded that one crop is mixed with another. The flow of cotton should be stopped long enough to keep the cotton of different owners separate. The loss of a few pounds of cotton may not be the most important factor. The topping off of a good bale of cotton with an inferior one may be a

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much more serious matter.

All of these are tremendously important points and should have the attention of growers and ginners. If operators do not know what they are doing, patrons should demand that they find out. If necessary it will be a good investment to pay slightly higher ginning charges for better quality of work.

The only entirely safe way to get pure seed from a custom gin is to establish a one-variety community and to restrict the ginning day for the farmers who are using pure seed of one variety, cleaning out all of the seed of the previous day's run before starting.

No valuable farm product is mistreated so much as is cotton in the bale. It stands abuse remarkably well, but the quality is lowered and millions are lost each year by the treatment that is given cotton in the South after it is baled. Cotton should be taken direct from the gin as soon as it is baled and placed off the ground under a good roof. It should not get wet, and should not be kept in a damp location, and in general should be treated like a product that is to be converted into clothing. The shelter can be a warehouse where the cotton is well covered by insurance, or it can be out on the farm in a private warehouse. This warehouse may be isolated from other buildings and constructed of sheet metal and protected with lightning arresters so that insurance will not be so important. The cost of this kind of storage is not great, and the annual charge against a crop is small. If the cotton has to be located in an inflammable building, insurance should be taken on it.

If cotton must be left in the open, it should be placed in a well drained location and should be supported on timbers as much as six or eight inches thick. At intervals of a week or less the bales should be turned over. But a shelter will pay big and save all the trouble of turning the bales.

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